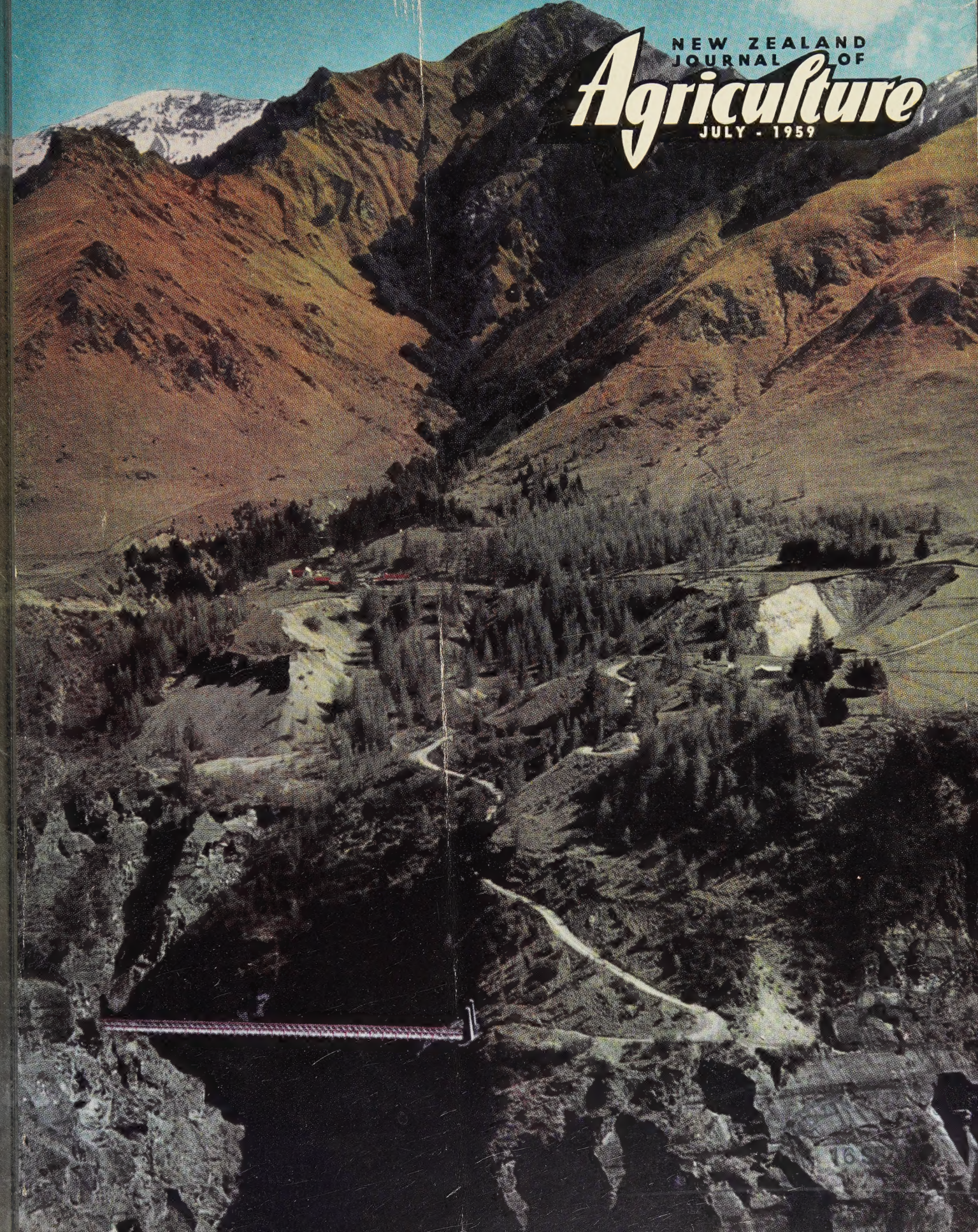


NEW ZEALAND
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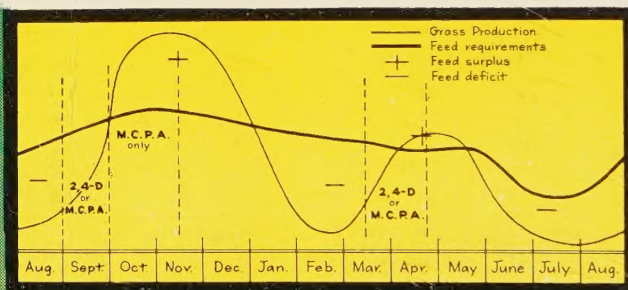
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Minister of Agriculture



[J. H. Johns photo]

The bridge shown on this month's cover is the well known suspension bridge over the deep gorge of the Shotover River on the road from Queenstown to Skippers, Central Otago. This district was made famous last century by the gold rushes to it, in which thousands of prospectors took part and where severe hardships were suffered in winning the gold. Today the gold workings are deserted and sheep and cattle are grazed in the area. On the Mt. Aurum Station, the homestead of which appears in the background of the cover, both wool and cattle production are carried out, but further west, toward the Main Divide, only cattle are run.

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Anti-foaming Agents Only Completely Reliable Method of

Preventing and Treating Bloat in Dairy Cows

By A. T. JOHNS,
Director, Plant Chemistry Division, Department of Scientific and
Industrial Research, Palmerston North

BLOAT in ruminants is by no means a new disease. It was described by a Roman author in 60 A.D. He recommended as a treatment "pouring vinegar through the left nostril and putting two ounces of grease in the jaws". A writer in 1807 recommended drenching with sweet oil, raw linseed, or even train oil or melted hog's lard to relieve a bloated animal. Some of these remedies are in use today. Though bloat has been known for a long time, it has been generally conceded in recent years that its incidence has risen with an increase in the use of legumes.

IN New Zealand it is estimated that from 10,000 to 20,000 dairy cows die of bloat annually, with some dairy districts suffering considerably greater losses than others. The total economic loss must be very high, as the decrease in milk production is probably of greater importance than the actual death toll. It is obviously difficult to

make estimates of losses in production, as even mild bloat will reduce feed intake in a herd. To this monetary loss must be added the loss of sleep and man-hours of work that a farmer has to suffer in watching a herd when bloat is prevalent.

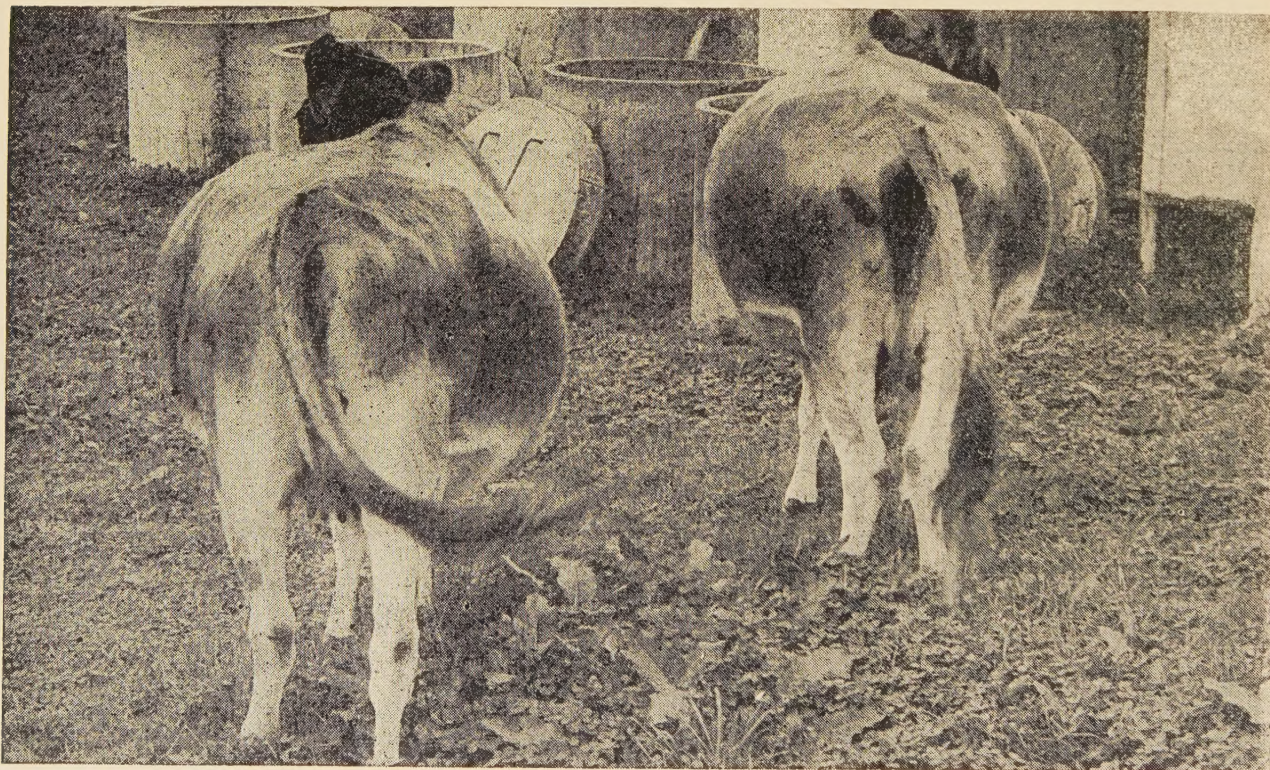
Bloat is most commonly associated with the grazing of lush green

legumes. Lucerne, white and red clover, ladino clover, and peas have all been incriminated at various times. Bloat is also frequently experienced in New Zealand on chou moellier and has also been occasionally reported on green cereals, lush young grass, *Amaranthus*, turnips, and cabbage.

Bloat on young spring grass appears to be not uncommon in England and has been produced experimentally on rapidly growing young ryegrass in New Zealand.

CAUSE OF BLOAT

The four stomachs of the ruminant animal enable large quantities of fibrous food to be utilised. Digestion of pasture by micro-organisms in the first two stomachs may produce something like 120 gallons of gas per day. Normally the animal can get rid of this gas by belching. When the animal cannot expel the gas, it accumulates, leading to the condition known as bloat, which if not relieved frequently results in death.



A pair of moderately bloated identical twin cows used for research at the Plant Chemistry Division, Department of Scientific and Industrial Research.



DR A. T. JOHNS, the author of this article, has been engaged for several years on studies of what happens during the processes of digestion by ruminants. This work has naturally led him into an investigation of the problem of bloat. Though the problem was an old one, very little was known of the mechanisms involved, and Dr Johns and his research team have had to work from very first principles. In 1954 Dr Johns was awarded a Commonwealth Fund Civil Service Fellowship. He studied ruminant digestion and met leading workers in that subject in the United States, Britain, and Australia. On his return to New Zealand he developed the work along the lines described in this article, so that the Plant Chemistry Division is now recognised as being in the forefront of world studies on these problems.

Many hypotheses have been put forward as explanations for the cause of bloat; for instance, lack of fibre in the diet, overeating of succulent feed, the occurrence of general poisons such as cyanide-containing substances in white clover, specific muscle poisons, and too rapid gas production. Any one of these hypotheses is, in itself, inadequate to explain why some animals in a herd bloat while others on the same pasture do not. Work at the Plant Chemistry Division, carried out with identical twin cows fed cut red clover, has clarified our ideas concerning the aetiology of the condition.

It has been found that

- Over a large number of feeding experiments the intake of cows has been less when they bloated than when they did not. This contradicts the view that bloat is due to overeating of succulent herbage.

- Bloat has been produced by feeding cut red clover at all stages of

growth and even clover hay. This demonstrates the fact that though most cases of bloat may occur on succulent herbage, succulence is not essential for the production of the condition. Attempts to control bloat by pre-feeding with hay have not been successful except in the United States by pre-feeding overnight with large quantities of Sudan hay. Moreover, outbreaks of bloat have been reported in cattle fed on lucerne hay. Some success in controlling bloat has been claimed from pre-feeding with silage.

- Neither belching nor the muscular activity of the fore-stomachs appears to be inhibited during the early stages of bloat. These observations contradict the view that bloat is due to a poison which causes paralysis of the fore-stomach or otherwise directly affects the belching reflex. While this may be true of some other types of bloat, it does not appear to be so in the condition as caused by the ingestion of clover.

- The tendency to bloat appears to be partly an inherited animal characteristic. However, when the pasture is potent enough all animals in a herd may bloat. Some animals may be susceptible to bloat at a particular period and not at others. This and other evidence indicates that the differences in bloating behaviour between individual animals is not due entirely to any constant factor such as some anatomical abnormality.

- There is a considerable variation in the rate and total amount of gas formed on different feeds, but when the belching mechanism is functioning

normally the amount of gas produced in the rumen is not a factor.

- The incidence of bloat has not been correlated with any particular weather.

- Administration of anti-foaming agents has proved to be the only completely reliable method of prevention and treatment of the condition.

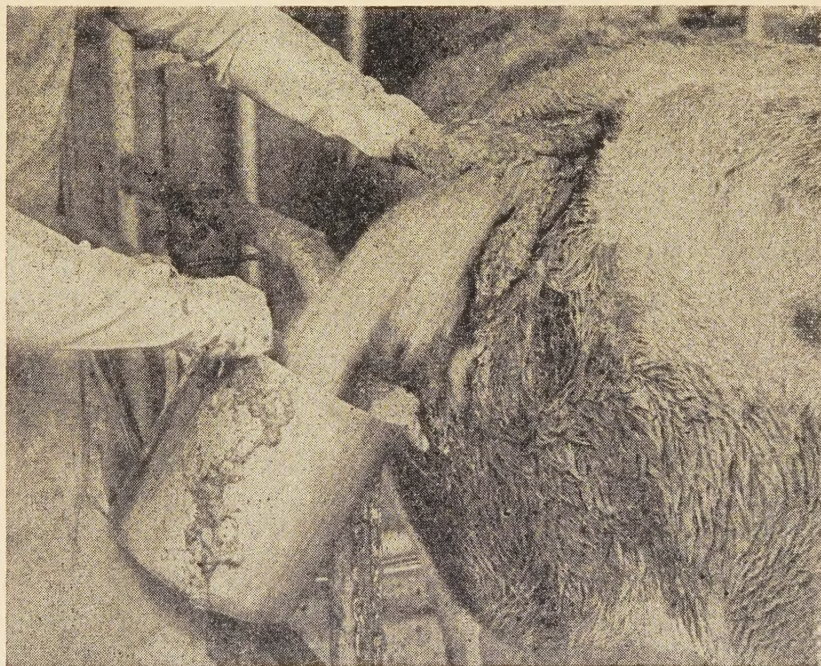
The cause of the uncomplicated pasture bloat appears to be the retention, in the form of a foam, of the greater part of the gas produced in the fore-stomachs.

In the past bloat has been classified into two distinct types described respectively as the frothy and free gas type. It is now considered doubtful whether in fact there are two distinct forms of bloat; it is believed that the supposed two forms are no more than different degrees of frothy bloat. It has been observed that in pasture bloat there is always some free gas in the rumen and it seems likely that the amount is a function of the stability of the foam.

TREATMENT

As foaming is the cause of bloat, the administration of anti-foaming agents should give relief. The use of anti-foaming agents (oils and fats) has a surprisingly long history. However, it was only when it was recognised that pasture bloat is a problem of foaming that the reason for the effectiveness of these substances was appreciated.

A number of anti-foaming agents have been used in the past which are



Foam pouring out of an experimentally bloated cow after removal of the plug from the rumen fistula.

PREVENTION AND TREATMENT OF BLOAT



Drenching a bloated cow with anti-foaming agent.

now considered unsuitable, for example, kerosene puts the animal off its food, while vegetable turpentine causes intense irritation of the mouth, adversely affects the animal's appetite, and is a cumulative poison. These agents are no more effective than the bland oils such as vegetable or mineral oils. Unexpectedly, the silicones, which in other circumstances are remarkably efficient foam breakers, have proved to be quite unreliable for the relief of bloated animals.

Moderate Bloat

The present recommended treatment for an animal that is not dangerously bloated is to drench it with about 2 to 4 fl. oz. of peanut or linseed oil or paraffin. A new product, "Bloat-Enz", which is a non-ionic detergent, appears very satisfactory. After drenching it helps if the animal can be stood facing uphill.

The alternative to drenching often suggested is the direct injection into the rumen through a large bore needle into the distended left flank. The deflation which results appears to be no quicker than that after drenching. This method has the disadvantage that gas sometimes accumulates between the paunch and outer skin of the animal after the needle is withdrawn. It is, however, less laborious when a large number of animals have to be treated quickly.

Drenches of bicarbonate of soda or carbonate of ammonia have been used in the past, but we have found that

they make the animal worse, if anything, and certainly cannot be recommended. A stomach tube or probang is useful in some cases where a large amount of free gas is present, but in the hands of an unskilled operator it can do more harm than if the animal were left alone.

Remedies such as a gag in the mouth or turning the hose on the animal have been claimed to give relief, but we have not found them at all reliable.

Where a farmer is experiencing bloat and has to treat animals, it is worth while to construct a rough crush pen with an old gate in the paddock so that he does not have to lose valuable time by having to drive the animals up to the milking shed.

Severe Bloat

Though foaming is the primary cause of bloat, in severe cases secondary complications such as a degree of paralysis of the stomach musculature may occur. While, therefore, anti-foaming agents can be used in moderate cases of bloat, more drastic measures are required for the dangerously bloated animal.

In extremely severe cases no time should be wasted by drenching, but the gases should be released by puncturing the body wall and paunch with a trocar and cannula or knife. The instrument is driven in boldly at the most prominent part of the distended left flank, anywhere between the last rib and the point of the hip and as near as possible to the loin. The gas should be allowed to escape slowly by

blocking the cannula with the thumb, as sudden release of pressure may kill the animal instantly.

On the other hand, there are many cases where the gas does not escape freely owing to the blocking of the cannula with the frothy ingesta. Here a gash with a knife, large enough to allow the hand to be inserted so that the stomach contents can be quickly removed, may be necessary to save the animal. Cows are remarkably resistant to infection and if the wound is stitched up by a veterinarian, the animal will, in most cases, quickly recover.

PREVENTION OF BLOAT

Pasture Management

The use of mature grass-dominant pastures is the best insurance against bloat. Under our system of pasture management we cannot do without clovers because of their vital role as suppliers of nitrogen to the sward. Just how low the proportion of clover has to be to provide a safe pasture will depend on the potency of the clover and on the selective grazing habits of the animals. In the United States 50 per cent has been considered safe, but in New Zealand we have seen bloat on pastures containing 25 to 30 per cent clover.

Other control measures may be considered, such as the use of safe feeds, that is, rough pasture, autumn-saved pasture, crops, and silage. The main value of these lies in their use for a period to allow dangerous pasture to mature.

To ensure the best utilisation of the taller, relatively mature pasture, grazing should be controlled with an electric fence. This reduces both the opportunity for selective grazing and wastage by trampling.

A less efficient system is to mow the pasture to let the animals pick up the feed off the ground. Wilting of the herbage before it is offered to the animals has been found to be of no value in preventing bloat on potent pasture.

There are, however, obvious limitations to any extensive use of such feeds as mentioned above, as it is not always possible to have them on hand when an outbreak occurs. There are always likely to be periods when a potent clover-dominant pasture has to be coped with.

There are two general methods available for dealing with outbreaks of bloat:

- (a) Administration of anti-foaming agents.
- (b) Oral administration of penicillin to slow down gas production.

Administration of Anti-foaming Agents

Oral Drenching

To be effective a certain concentration of anti-foaming agent must be maintained in the paunch over the whole period during which the animal is eating bloat-producing herbage. The oils unfortunately appear to be quickly lost because of their low water solubility and will protect the animals for only 2 to 4 hours.

A search has been made for anti-foaming agents that are more water soluble than the oils and which remain longer in the rumen. Recently "Bloat-Enz" has been found to be useful in that a dose of $\frac{1}{2}$ oz will protect an animal from bloat for a day. This can be administered to animals in water in a multiple-dose drenching gun.

Treatment of Drinking Water

The addition of anti-foaming agents to the water supply is the most convenient method of administration in the field. The main drawback is that the drinking pattern varies widely from animal to animal and even in the same animal from day to day.

The oils protect an animal for only 2 to 4 hours; hence an animal would have to drink as frequently as that for complete protection. Heavy liquid paraffin has been used with some success in dry weather by maintaining a layer of oil $\frac{1}{4}$ to $\frac{1}{2}$ in. thick on all the water troughs to which the animals have access. While this treatment will usually reduce bloating, it does not eliminate the hazard.

It had been hoped that the detergent "Bloat-Enz" would be useful for addition to water troughs, but unfortunately in trials so far it has proved unpalatable to stock in drinking water. The addition of lime or acids to the drinking water has not proved a reliable method of control.

Pasture Spraying

The most reliable method of bloat control is total area spraying with anti-foaming agents, since the cows are always on sprayed pasture and have no option about taking in anti-foaming agent with the bloat-producing herbage. In this method the whole area to be grazed by the cows in 24 hours is sprayed at the rate of not less than 3 oz of oil per cow per day. The rate of oil per acre will depend on the density of feed, while the actual volume made up will depend on the performance of the spraying equipment used.

The sprayed area is usually given in three or four breaks to reduce waste and topping.

There are four main precautions which must be taken in using this method:

1. The area to be grazed must be judged conservatively. If too large an area is allowed, the anti-foaming agent may be spread too thinly and an insufficient amount of it may be taken in by individual cows.
2. There must be no access to unsprayed pasture. The animals must be confined to the sprayed area by an electric fence and the pasture sprayed that can be reached from under the fence.
3. The area should be sprayed as evenly as possible; for example, the boom height must be such that the cones of spray overlap and do not have strips of unsprayed pasture between them.

Spraying Pastures with Vegetable Oils or Paraffin Oil

THE recommended mixture for 50 cows is:

Anti-foaming agent: 1 gallon of oil

Emulsifying agent: 1 to 4 fl. oz. of "Lissapol NX"

Water to required volume to cover area

Emulsifying Procedure

1. Boom cut-off valve and oil feed valve are shut with oil in the tank. Emulsifying agent and water (two to four times volume of oil) are put in the main tank.

2. Water is circulated through pump, with at least 40 lb per square inch showing on the gauge. Oil is run in slowly by opening the oil feed valve.

3. When all oil has run in, the oil feed valve is shut and the emulsion circulated for a short time (about three minutes). The concentrated emulsion is diluted with water to the required volume mark. If desired, the pump can be left running while the tractor is driven to the paddock and the diluted spray will be well mixed.

Note: The pump must be kept well greased, as the emulsifying agent will remove grease in the first stages of emulsification.

Cost of peanut oil is about 6d. per cow per day.

Cost of paraffin oil is 2½d. per cow per day.

* There are two other grades of "Lissapol"—N and N300. "Lissapol N300" may be used at the same rate as NX, "Lissapol N" at three times this rate. The amount of "Lissapol" used will depend on the time it is required to store the emulsion. The lower rate can be used where it is mixed in the drum and sprayed soon afterward.

... PREVENTING BLOAT

4. Back grazing on regrowth must be avoided.

The anti-foaming agents which are most commonly used are vegetable oils (particularly peanut and raw linseed), heavy liquid paraffin ("Shell Odina Oil" or "Vacuum White Oil 890"), and tallow (fresh or left over from cooking such as from fish and chip shops).

It was earlier thought that the use of liquid paraffin over a period might have deleterious side effects on the cows. Trials have been carried out with the Dairy Research Institute and it is now apparent that our fears were unfounded as far as New Zealand conditions are concerned. As paraffin is about half the price of peanut oil, it is likely to be used more extensively in the future. The use of liquid paraffin has reduced the cost of spraying to about 2½d. per cow per day, while the use of emulsified fat can be carried out for under a penny per cow per day.

Equipment: The basic equipment is a standard low-volume spraying outfit with a gear pump mounted on a tractor. Where liquid oils are used a small auxiliary tank to hold the oil before emulsification may be fitted on top of the main spray tank. Oil is fed from this tank through a short hose and control valve into a T piece in the inlet hose.

The method of spraying pastures with vegetable oils or paraffin oil is set out at left and that for spraying with emulsified tallow is given on page 9.

General Comments on Pasture Spraying

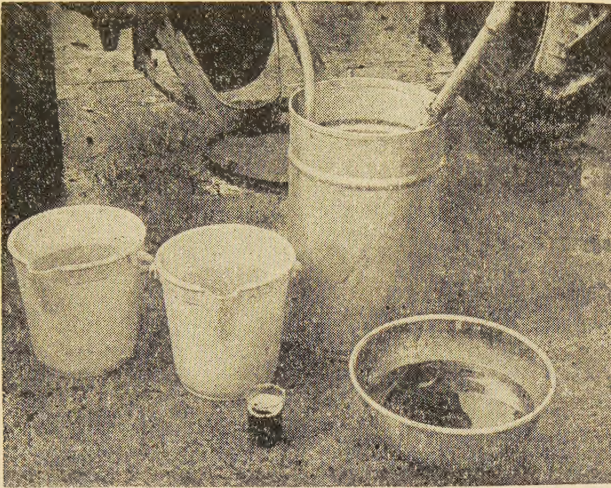
Sprayed pasture may be a little unpalatable at first, but cows very quickly become used to it. In no case has taint occurred in the milk or cream after the grazing of sprayed pastures. If taint does occur, the possibility of contamination of milk in the milking shed should be investigated.

Oil sprays stand up to a certain amount of weathering, but it is not desirable to spray more than 48 hours in advance.

If spraying does not completely control an outbreak of bloat, even when increased rates of emulsion are used, check whether the cows have access to any unsprayed area, especially through fences, or whether a good emulsion is being obtained.

If one cow bloats consistently, it may be a chronic bloater. Spraying is intended to control "uncomplicated" acute frothy bloat, whereas other factors may be the cause of chronic bloat. The chronic bloater should be examined by a veterinarian.

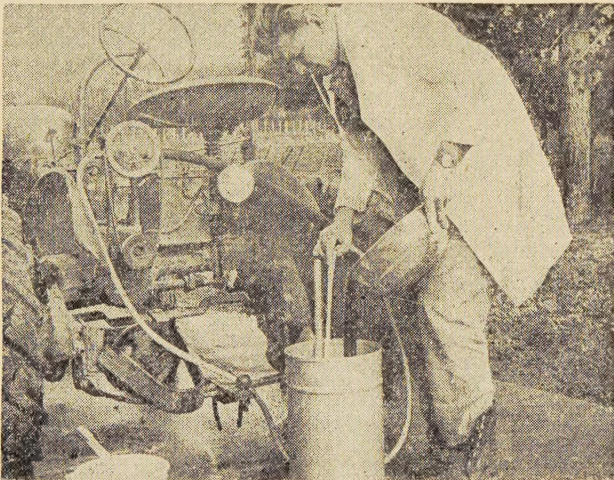
PREPARING EMULSION FOR PASTURE SPRAYING



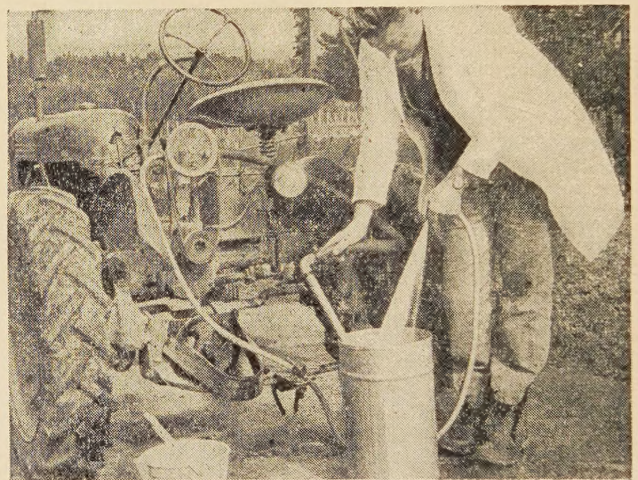
1—Melted fat in basin and equipment ready for emulsifying.



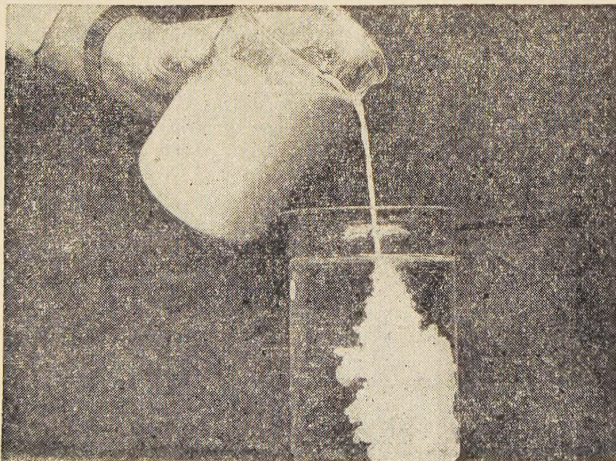
2—Stirring emulsifying agent into melted fat.



3—Warm water being circulated through the pump as fat is poured in.



4—Mixture of fat, emulsifying agent, and water being circulated until a good emulsion is formed.

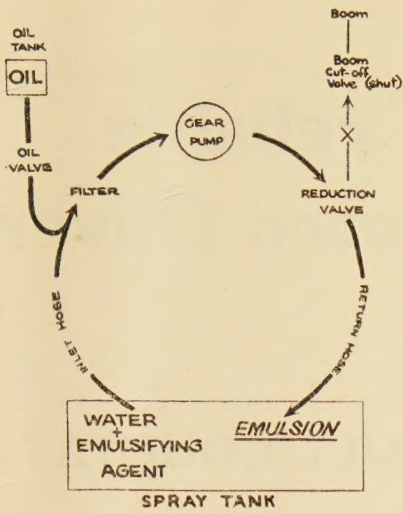


5—When the emulsion is produced it disperses readily in cold water.



6—Spraying the emulsion on pasture.

PREVENTION AND TREATMENT OF BLOAT



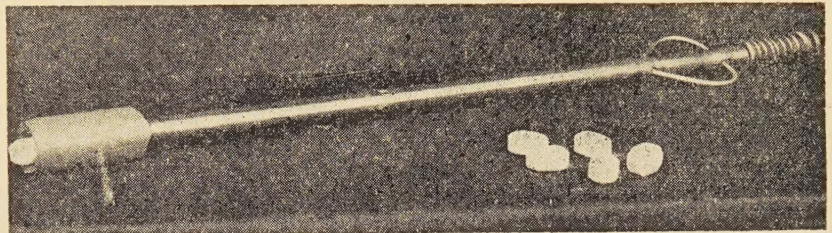
Flow diagram for making of oil emulsions with modified low-volume spraying equipment.



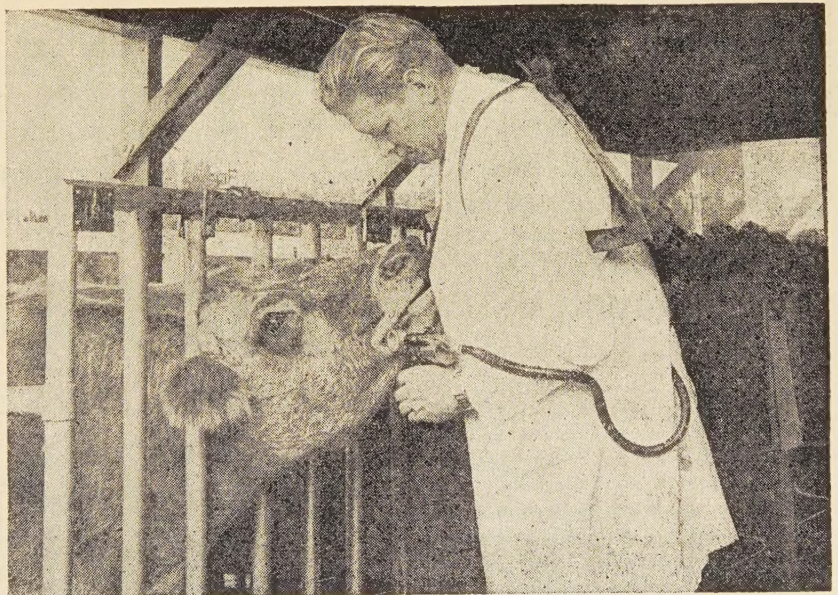
Pasture spraying should be used in conjunction with break grazing. All pasture available to animals must be sprayed, including that which can be reached under the fence.



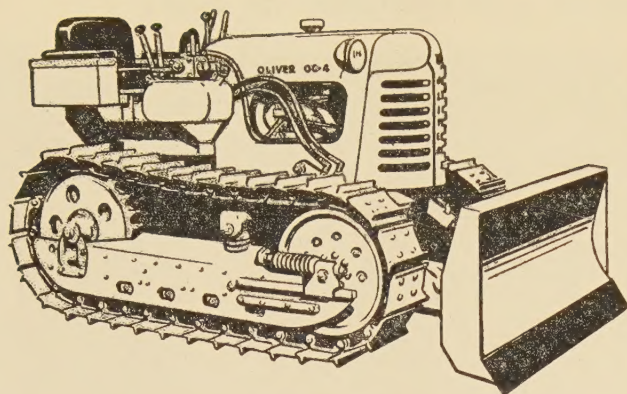
Emulsified fat on clover leaves.



Penicillin can be given in tablet form with a long balling gun.



Penicillin or "Bloat-Enz" being given to cows in liquid form.



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The idea of reducing the rate of fermentation and hence gas production in the paunch has been tried many times, but penicillin appears to be the first compound that does it effectively without at the same time reducing production or affecting the health of the animal. Penicillin has been tried in various parts of the world with varying success. The dose rate used in New Zealand has been 100,000 to 200,000 units of procaine penicillin given by mouth at intervals of two to three days. The antibiotic takes eight to 12 hours to become effective; consequently it is not suitable for the treatment of bloated animals.

Dose rates up to 500,000 units have been found to be without harmful effects in New Zealand trials, though cases of animals going off their feed have been reported overseas. The penicillin does not pass into the milk, so there is no danger of its inhibiting cheese starters or producing resistant mastitis organisms.

It has been found on repeated dosing that the effectiveness of penicillin for bloat control diminishes. About three weeks appears to be about as long as regular treatment can be continued. If penicillin dosing is then discontinued

for a period, its effectiveness is re-established.

A practical difficulty with penicillin is the method of administration. Though the material may be given with concentrates, many cows in a herd will refuse meal offered in the bail at the time of lush clover growth. The alternative to feeding is the procedure of individual dosing, either tablets or a freshly made-up drench being used. Hence penicillin appears to be most useful where a farmer wishes to protect a small number of his herd from bloat for a period.

In some areas farmers add penicillin to a drench of oil when treating a bloated animal to protect it for the next two or three days. This is a most desirable practice where a cow is bloating badly for several days in succession.

Penicillin treatment should be used in conjunction with break grazing; otherwise the treated animals may overeat on occasions to such an extent that they will not let their milk down.

PLANNING FOR BLOAT PREVENTION AND CONTROL

There are now available methods of bloat control which will enable the most bloat-prone pasture to be grazed safely. However, no system has yet been devised to protect against the sporadic outbreaks in a dairy or beef herd.

The methods outlined are intended as a guide which a farmer can adapt to his own requirements. The farmer with hilly country will not be able to spray his pastures and so may choose to use paraffin oil on water troughs, penicillin treatment, or dosing with "Bloat-Enz". The farmer who decides to spray his pasture may prefer to meet the extra cost of oil spraying to going to the trouble of emulsifying used tallow. Each of the measures has certain advantages in particular circumstances.

The long-term aim should, of course, be to produce grass-dominant pastures and to graze these at a fairly mature stage of growth. The development of short-rotation (H1) ryegrass, with its vigorous growth in spring and its high palatability even when mature, can make a major contribution to this problem.

Acknowledgments

The procedures for emulsifying oils and fats and for pasture spraying have been worked out by C. S. W. Reid and Peter Vlieg, of the Plant Chemistry Division.

Spraying Pastures with Emulsified Tallow

FRESH or used tallow can be used for pasture spraying. The only reservation is that it should not contain any hair or solid matter that will block the filter. Used fat such as from fish and chip shops has been found to be quite satisfactory.

The recommended mixture for 50 cows (at the rate of 3 oz per cow) is:

Tallow: 10 lb

"Lissapol NX" 10 fl. oz. (or $\frac{1}{2}$ lb)

Water to volume

Emulsifying Procedure

1. Tallow is heated to blood temperature (about 100 degrees F) and the "Lissapol" stirred into it. The mixture may be cooled and stored at this stage or the procedure continued.

2. Approximately 3 gallons of water at just above blood heat (water has to be hotter for mutton tallow than for beef) are put in a 5-gallon container in the main drum. Water is circulated through the pump on the tractor and back into the container through a nozzle while the melted tallow (plus "Lissapol") is added. This quickly forms a concentrated white creamy emulsion which can be stored or

3. It can be placed in the main drum and diluted with the required volume of cold water. This diluted emulsion can be circulated through the pump as the tractor is driven out to the field.

Note: (a) If this sequence of events is adhered to, a stable emulsion is formed without the

use of additional stabilising agents.

(b) If the material is stored at stage 1, it is simpler to melt the mixture before tackling stage 2, but this is not absolutely necessary.

(c) Water at stage 2 must not be too hot, or the emulsion will break down. If it is stored at stage 2, some fat may separate and form a skin on top. This is easily dispersed again by giving it a few vigorous stirs with a stick. Where larger amounts of fat are used it is not necessary to increase the amount of water in proportion. Over 20 lb of tallow can be emulsified in 4 gallons of water.

(d) If the fat is dirty and contains foreign material, it should be strained before use. It is not then necessary to have any filters in the lines except perhaps a foot filter on the intake line. If the filter is blocking with fat particles, it probably means that the water used for emulsifying at stage 2 was not hot enough.

The cost of this procedure will depend on what is paid for the tallow. Used fish and chip fat is purchased at £5 per drum in Palmerston North. This makes the cost of bloat control with this material under a penny per cow per day.

This method may at first sight appear time consuming, but once the technique is running, the total time taken should not exceed an hour per day unless the paddock to be sprayed is a long way from the shed.



Farm Improvement on North Otago Downlands

IN April 1956 there was published in the "Journal" an article dealing with the improved handling of a North Otago farm. This dealt only with the stock aspects, since the farm being considered was too steep for harvesting operations. The following article deals with a similar five-year improvement programme on another property and shows how grain and small seeds have been fitted into the farming routine to make an effective contribution to the farm income. As North Otago's climate and soil are ideally suited to cropping and as it is necessary to diversify production as much as possible, every effort should be made to maintain a high standard in crop production in the area.

THE Herbert, Waimotu, Maheno, and Kakanui country to the south of Oamaru is all easy rolling downlands which have been intensively cultivated from earliest times and have grown a large quantity of grain. The soil is variable, being mainly Timaru, Claremont, or Opuha silt loams. The area receives slightly more rain than most inland regions and does not dry out so quickly during summer, rainfall averaging about 23 in. The area is colder and later in spring compared with other North Otago districts.

Properties in the district at present range from 150 to 400 acres, 90 to 95 per cent being ploughable. Stock carried approximates 2 ewes per acre, with good lambing percentages and wool weights. In addition to this, 10 per cent of the average farm would be in cereals and 10 per cent in small seeds. For stock wintering, chou moellier, swedes, or turnips are grown and hay is provided from either pasture or lucerne.

The lines along which these properties can be developed to a better

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standard of husbandry and financial return are shown by what has been achieved on the farm of Mr J. L. Bishop at Waimotu. It is 362 acres in extent with an effective ploughable area of 340 acres.

Seven years ago the property was carrying 450 ewes and in good years some hoggets were kept as well. The ewes gave 120 per cent lambing, which started in mid September, and shored 9½ lb of wool. The death rate was approximately 3 per cent. For winter feed requirements 15 acres of chou moellier and turnips were grown and a small amount of hay was saved from grass paddocks. No lucerne was grown.

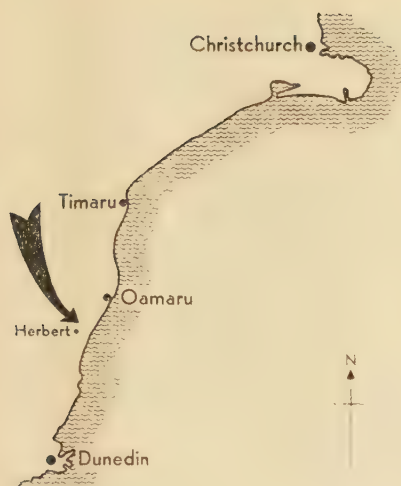
Pastures were sown down with rape or oats and, with the absence of DDT and inadequate (1 cwt per acre per year) dressings of superphosphate, swards were not long lived or productive. Each year 60 acres of cereal cropping was done, with wheat and oats, which yielded comparatively well. Paddock sizes averaged 30 acres and there was no water in most of them.

The farm presents a very different picture today. Carrying capacity has gone up over 100 per cent to 960 ewes maintaining the same figures of 120 per cent lambing, 9½ lb of wool, and 3 per cent deaths. To do this, field size has been halved, with a reticulated water supply, and 62 acres of lucerne have been sown. Sixty acres of crop are still grown and production is more diversified, but cash cropping now constitutes only 15 acres of wheat per year, with the remaining 45 acres as small seeds such as ryegrass, white clover, and Montgomery red clover. In addition in favourable years when hay and grazing requirements have been catered for, lucerne is also shut for seed.

Crop Rotations

As there were no serious weed or fertility problems, it was not necessary to introduce any type of rotation

HEADING PHOTOGRAPH: Rotational grazing with large mobs of sheep gives uniform control of pastures for subsequent shutting for seed crops. This policy also reduces the problem of worms in stock.



Locality of farm.

aimed at correcting either of these troubles. One field did indeed have "old man" twitch trouble, but where the policy is to increase stocking by better feeding and management it has not been found necessary to give any special attention to twitch as a weed. Under the influence of heavy brassica and short-rotation ryegrass crops and subsequent high-producing pastures twitch does not long remain evident.

Expenditure on long initial fallows and costly working is not warranted and the money is far better directed toward manure, seed, and stock. Accordingly, the rotation adopted on the farm was one which is becoming increasingly popular in the district: from pasture ploughed in August-September to chou moellier in December; fed off the following winter and into rape in the spring. Wheat follows the rape and after a winter greenfeed

crop the field is summer fallowed and sown to new grass in late January-early February. It is not suggested that this programme should be followed implicitly; it is in fact capable of variation to suit stock, crop, and market fluctuations, provided always, of course, a balance of feed and crop is grown, with the correct proportion going down to new grass each year.

Cropping

While prices for wool and meat remained at satisfactory levels it was not to be expected that cash cropping would take a very large place in the farm economy. Nevertheless on those properties which can crop it is a very convenient and remunerative alternative to carrying maximum stock and gives a greater spread to seasonal labour demand with less capital investment. Both are very desirable practices, especially in the early stages of development.

On Mr Bishop's property in 1957 the income from 960 ewes plus the crop was virtually the same as the income from what the maximum carrying capacity of about 1,350 ewes would return. With the farm kept in such a balance it is comparatively easy to make fairly rapid adjustment to either crop or sheep according to trends in the market without seriously upsetting the farm routine.

The wheat grown is Arawa and gives excellent yields of over 60 bushels per acre. Coming after rape it is convenient and cheap to establish. Though it is not the practice to graze the wheat in early spring, it does

nevertheless create a valuable reserve of feed which could be used in the event of an extraordinarily late spring and gives an extra insurance policy to high stock numbers at the most critical time of the year.

Similarly grass and legume seed crops are saved not to a set routine but purely as a reflection of the season and stock requirements. The grass and white and red clover, all having staggered times for closing, allow a fairly close and accurate assessment to be made of feed demands.

At the outset it is wise to grow either perennial or short-rotation ryegrass to avoid the field contamination which is almost sure to result if both are grown on the same property. Admittedly with care it can be done, but the risk is always present.

Clover sowings are staggered to alternate between pure white with ryegrass and white and red with ryegrass. In this manner one or two pastures on the farm can always be saved for either red or white clover, depending on the state of the market. Lucerne would, of course, also be included in this legume programme and if prospects were better for it, it would be saved in preference to clovers. The ultimate effect on the pastures of seed saving is also worth considering here.

Closing dates are approximately mid September for perennial ryegrass, early to mid November for white clover, and early December for red clover and lucerne. Grazing of short-rotation and Italian ryegrass can be continued for a further four weeks before closing if the season is a good



A large area of lucerne is important. This ensures plenty of quality hay and good early spring greenfeed and provides an insurance against periodic droughts such as occurred last spring.

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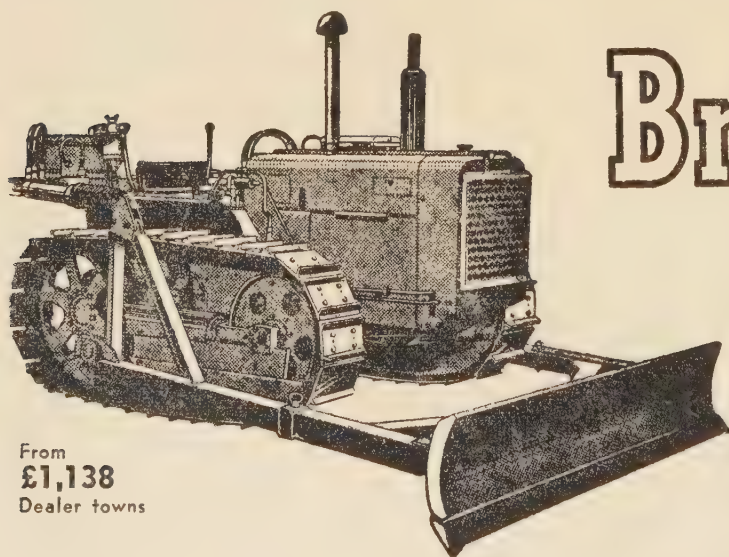
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one. With ryegrass, though, it is always a good management procedure to get a strong crop which lodges in an endeavour to reduce the incidence of blind seed disease. It might sometimes pay to use dressings of sulphate of ammonia.

From chou moellier ewes are → put on to greenfeed when they have lambed until new grass and lucerne are available.

Pastures

The pastures serve a dual function—grazing and seed. Consequently mixtures are simple:

1 bushel of perennial ryegrass
3 lb of white clover

or

1 bushel of perennial ryegrass
2 lb of white clover
3 lb of Montgomery red clover

The highest grade of certified seed available is always sown. Pastures are put down in late January after a summer fallow and sown with 3½ in. centres to give a good dense sward. Usually they provide two or three light grazings before going into winter with sufficient growth to give a good

Keeping up to date with cultivation is important if maximum benefit is to be made of weathering. Here a firm seedbed is almost ready for rape.

spring bite. Early in the first spring DDT grub proofing is applied. Lucerne is used to avoid overgrazing in late spring and summer.

The lucerne, which is also treated as pasture, with the accent on hay-making, is sown about mid December and usually requires one topping or grazing before being closed for winter. The stand will have several inches of growth on it which can be utilised during winter in place of the first cut.

The first growth of lucerne is always grazed as greenfeed. It is then shut about mid October for hay so that all hay requirements are met by early December and it can again be used for grazing and seed. It is considered that there is no place for lucerne-grass mixtures and lucerne should always be sown as a pure stand.

Topdressing

With the increased production now coming from the property, fertiliser usage is high. Lucerne each year receives no less than 2 cwt of superphosphate in early spring and a ton of carbonate of lime every four years and is sown with 2 cwt of reverted superphosphate.

Weed control is important, but → the use of chemical sprays is kept to a minimum by adoption of sound management practices.



Pastures are sown with $1\frac{1}{2}$ cwt of superphosphate and receive DDT in $1\frac{1}{2}$ cwt of superphosphate in their first spring with a repeat of DDT as necessary. Fortified superphosphate is used for maintenance topdressing. Lime is applied every eight years. Brassica crops are sown with 2 cwt of reverted superphosphate and the wheat and greenfeed with similar amounts of fortified superphosphate.

Stock

Very briefly stock management aims at growing a plentiful supply of feed for early lambing, starting on 10 August, and weaning by late November and getting lambs away at 30 to 32 lb as quickly as possible.

With the large area of lucerne, ewes can be maintained at a high level of nutrition and kept at peak condition during their lactation. After weaning the ewes are put to the worst paddocks to reduce their condition, while the lambs get the best pasture and lucerne and, if need be, are finished on the rape. Ideally it should be possible to do without the rape.

After lambing the ewes are rotationally grazed round the farm. It has not been found possible to maintain set stocking under maximum carrying capacity. If the best is to be made of available feed, rotational grazing is essential.

Conclusions

Any satisfactory conclusions drawn from the foregoing must inevitably come down to a consideration of the capital involved. All the improvement work has been done out of the income earned during the five-year period. This has involved an increase in the sheep flock of over 100 per cent; new sheep yards; two new tractors and over one mile of new fencing for subdivision, plus renovation of old fencing and water supply reticulated to all fields; improvements to the home and a large increase in soil fertility due to better husbandry methods. Even if increases in open market values are ignored, the property has improved its capital position by over 100 per cent.

One of the main aims, however, in the development of the property has been to increase as far as possible the gap between income and costs and this has been done to an appreciable degree. Seven years ago less than a third of the gross farm income could be classed as surplus to expenditure. In 1957-58 this extended to half or more. This has put the farm in a much more secure position during the lower prices and guaranteed continued production at a high level. Finally, and most important, is the personal satisfaction in having a well run farm.

RADIO broadcasts for farmers will be given in August as follows:

1YA Auckland, 7.45 p.m.

6 August—"Barley Grass Control", by H. McMillan, Instructor in Agriculture, Department of Agriculture, Auckland.

13 August—"Topical Livestock Matters", by G. Durham, Veterinarian, Department of Agriculture, Papakura.

27 August—"Regulations Governing the Importation of Livestock into New Zealand", by J. J. Brown, Port Stock Inspector, Department of Agriculture, Auckland.

1XH Hamilton, 12.33 p.m.

10 August—"Rearing Healthy Calves", by L. P. Wells, Livestock Instructor, Department of Agriculture, Hamilton.

17 August—"Barley Grass Control", by M. G. Boyer, Instructor in Agriculture, and P. F. Goulding, Fields Instructor, both of the Department of Agriculture, Hamilton.

24 August—"Investigations on Times of Fertiliser Application", by J. Karlovsky, Department of Agriculture's Soil Research Station, Rukuhia.

31 August—"Services for the Farmer", by R. Catchpole, Federated Farmers.

1YZ Rotorua, 7.15 p.m.

12 August—Y.F.C. talk, by Rotorua district committee.

26 August—"Soil Testing and Trace Elements", by R. W. Moody, Instructor in Agriculture, Department of Agriculture, Rotorua.

2XA Wanganui, 8 p.m.

6 August—"For the Country Woman", by Mary MacDonald.

13 August—"Farming News".

20 August—Wool Handling Field Days", by P. C. Marshall, Sheep and Wool Instructor, Department of Agriculture, Wanganui.

27 August—"Field Trials with Potato Varieties", by A. K. Booth, Instructor in Agriculture, Department of Agriculture, Wanganui.

2XG Gisborne, 8 p.m.

18 August—"Stockowners' Question Time", by E. B. Smythe, Livestock Instructor, Department of Agriculture, Gisborne.

2YZ Napier, 7.10 p.m.

4 August—"Causes of Rejection and Condemnation of Stock at Freezing Works", by H. W. Russ, Meat Inspector, Department of Agriculture, Hastings.

18 August—"Pasture Management", by G. M. Bennett, Instructor in Agriculture, Department of Agriculture, Hastings.

2ZA Palmerston North, 12.36 p.m.

3 August—"Springtime Notes on Field Drainage", by K. L. Mayo, Instructor in Agriculture (Field Drainage), Department of Agriculture, Palmerston North.

17 August—"Metabolic Diseases", by G. T. Williamson, Veterinarian, Department of Agriculture, Palmerston North.

31 August—"Some Pests and Diseases of Commercially Grown Vegetables", by R. A. S. Waters, Horticultural Instructor, Department of Agriculture, Palmerston North.

3YA Christchurch, 12.20 p.m.

3 August—"Blueprint for Soil Conservation", by G. Dunbar, Research Officer, Soil Conservation Section, Department of Agriculture, Christchurch.

17 August—Review of "The New Zealand Journal of Agriculture", by E. G. Smith, Instructor in Agriculture, Department of Agriculture, Rangiora.

4YA Dunedin and 4YZ Invercargill, 12.36 p.m.

3 August—"Seedbed Preparation", by R. C. Stephen, Instructor in Agriculture, Department of Agriculture, Balclutha.

10 August—"Beef Cattle", by I. M. Cairney, Veterinarian, Department of Agriculture, Dunedin.

17 August—"The Use of Lime", by A. R. Rankin, Fields Instructor, Department of Agriculture, Invercargill.

24 August—"Uses of Dalapon", by M. L. Smetham, Instructor in Agriculture, Department of Agriculture, Gore.

31 August—"Ewe Management", by A. J. Langford, Livestock Instructor, Department of Agriculture, Balclutha.

Regular Sessions

1YA Auckland, Mondays at 12.36 p.m. ("Country Journal", including "Report from Ruakura"), Tuesdays, Wednesdays, Thursdays, and Fridays at 7.45 p.m. ("Country Journal"), Thursdays at 12.33 p.m. ("News for the Farmer").

1XN Whangarei, Mondays at 8 p.m. ("Northland Stock Market Report" followed by "Farming for Profit"), Wednesdays at 8 p.m. ("Farming for Profit"), and Fridays at 12.33 p.m. ("Farm News").

1XH Hamilton, Mondays at 12.36 p.m. ("For the Farmer", excluding first Monday in month and public holidays), Wednesdays at 12.33 p.m. ("Report from Ruakura").

1YZ Rotorua, Wednesdays at 7 p.m. ("Bay of Plenty Journal"), Thursdays at 12.33 p.m. ("News for the Farmer").

2YZ Napier, Tuesdays at 7.10 p.m. ("The Hawke's Bay Farmer"), and Thursdays at 12.33 p.m. ("News for the Farmer").

2XG Gisborne, Tuesdays at 8 p.m. ("Farm Session").

2XP New Plymouth, Fridays at 8 p.m. ("Farm Session").

2XA Wanganui, Mondays at 8 p.m. ("For the Man on the Land"), Tuesdays at 8 p.m. ("Farm Supplement"), and Thursdays at 8 p.m. ("Farm Topics").

2XN Nelson, Thursdays at 8 p.m. ("Nelson Farm Topics").

2ZA Palmerston North, Mondays at 12.36 p.m. ("Country Digest") and Fridays at 8.30 p.m. ("Country Digest", including Feilding stock market report).

2YA Wellington, Mondays, Tuesdays, and Fridays at 7.10 p.m. ("Farm Session"), Thursdays at 12.33 p.m. ("News for the Farmer").

3YA Christchurch, Mondays at 12.20 p.m. ("Country Session"), Thursdays at 12.33 p.m. ("News for the Farmer") and 7.10 p.m. ("Home Paddock").

3XC Timaru, Wednesdays at 8 p.m. ("Farmers' Weekly News Service") and Saturdays at 10.30 a.m. ("Country Mailbag").

3YZ Greymouth, Mondays at 12.36 p.m. ("Farm Session") and Thursdays at 12.33 p.m. ("News for the Farmer").

4YA Dunedin, Mondays at 12.36 p.m., Tuesdays at 12.33 p.m., Wednesdays at 12.33 p.m., and Thursdays at 12.33 p.m. ("News for the Farmer").

4YZ Invercargill, Mondays at 12.36 p.m., Tuesdays at 12.33 p.m., Wednesdays at 12.33 p.m., and Thursdays at 12.33 p.m. ("News for the Farmer").



Handling Chinese Gooseberries for Long Storage and Export

By W. A. FLETCHER, Citriculturist, Auckland, M. G. BAUMGART, Storage Specialist, Wellington, and B. M. PIPER, Horticultural Instructor, Tauranga, all of the Department of Agriculture

BECAUSE of rapidly expanding production future supplies of Chinese gooseberries reaching the market during the peak of the season are likely to become excessive. Realising this danger, growers are looking more and more to cool storage and export markets to spread their marketing and to absorb surpluses.

SOME years ago it was found that Chinese gooseberries could be held satisfactorily at 31 to 32 degrees F and that fruit harvested from late May to mid June appeared to possess the longest storage life. However, Chinese gooseberries shipped to England and Australia in recent years have sometimes arrived soft and shrivelled and packs have been slack and jumbled. This has not only reduced returns but by endangering buyer confidence overseas has threatened the successful establishment of an export trade.

Because of this, further investigation into the storage of Chinese gooseberries was made by the Department of Agriculture during the 1957 season. The effect on keeping quality of storage temperatures and humidities,

polythene film case liners, varietal differences, and delaying and interrupting cool storage was studied. Vitamin C analyses of fruits were also made.

Results of Investigations

It was found that Chinese gooseberries were not very susceptible to attack by decay organisms during storage and the few rots observed could all be directly attributed to infection following mechanical injuries. Losses during and after cool storage were almost entirely due to over-maturity followed by fermentation breakdown of the fruit.

Effect of Storage Temperatures

On inspection immediately after 102 days' storage, fruit held at 30 to

A typical block of Chinese gooseberries trained over a pergola. Production of Chinese gooseberries is expanding rapidly and growers are looking more and more to cool storage and export to spread their marketing and absorb surpluses.

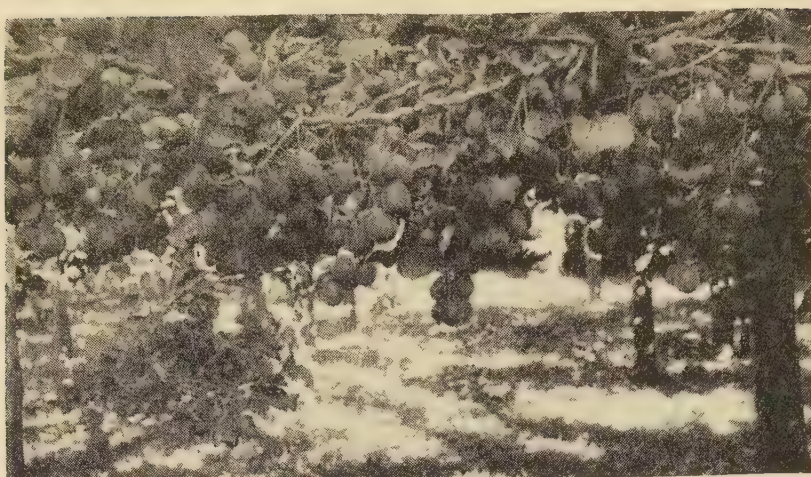
32 degrees F was significantly firmer in condition than fruit held at 35 to 37 degrees. Sixteen days after removal from cool storage and after railage from Wellington to Auckland differences in favour of the lower storage temperature were more marked. Further evidence of the superiority of lower temperatures for holding Chinese gooseberries was provided by good results obtained in another experiment, where the fruit was held for 143 days at 32 to 34 degrees F.

Effect of Polythene Liners and Relative Humidity

Relative humidity in the cooler storage chamber at 30 to 32 degrees F could be maintained at no more than 85 per cent whereas in the warmer chamber at 35 to 37 degrees F it was 90 to 94 per cent. This difference in humidity levels was consistently reflected in more shrinkage of fruit in the cooler chamber when normal green wax paper case liners were used.

It was found, however, that polythene liners were very effective in maintaining high humidity round the fruit, irrespective of humidity conditions in the storage chamber. Polythene liners were outstanding in improving the keeping quality of Chinese gooseberries, with no detriment to their flavour.

STORAGE OF CHINESE GOOSEBERRIES



Chinese gooseberries maturing on a vine. These fruits are rich in vitamin C and are becoming increasingly popular in New Zealand. Small shipments to Britain and Australia are also being well received.

Sweating occurred in polythene-lined cases, but was not serious. In some cases it was associated with a slight growth of fungal hyphae on the surface of a few fruits, but fruit quality was in no way affected and once the cases were opened and the fruit exposed to the air the trouble disappeared. Perforating the polythene liners might prevent sweating without unduly reducing their effectiveness.

Because of the success with polythene in these investigations all Chinese gooseberries exported during the 1958 season were packed with polythene liners, and their effectiveness on a commercial scale was confirmed. Fruit arrived in Britain in excellent condition with packs tight and attractive and this was reflected in favourable comments and returns for the shipment. Polythene liners are being used again for this season's export shipments, but further experiments with liners of a better quality wax paper are proposed with a view to reducing packing costs.

Differences in Keeping Quality between Varieties

There were significant differences in keeping quality between fruit of Abbot, Bruno, and Hayward varieties which were studied in this investigation. On inspection immediately after cool storage for 102 days at 30 to 32 degrees and 35 to 37 degrees Hayward was in far better condition than the others. Abbot was superior to Bruno at 30 to 32 degrees, but at 35 to 37 degrees the position was reversed. Bruno, however, showed a greater tendency to shrivel during cool storage, and the fruit on removal to room temperatures declined in condition more rapidly than the other varieties.

Sixteen days after removal from cool storage Hayward was still in very good condition and much superior to Abbot, but the condition of Bruno was very poor for both storage temperatures.

Though the Hayward variety appears to keep better than Abbot or Bruno, under good storage conditions the last two varieties can be held in good condition for long periods. There is evidence that Abbot and Bruno are heavier producers than Hayward and therefore tend to be more popular for planting.

Delaying and Interrupting Cool Storage; Effects on Keeping Quality

It seems desirable to place Chinese gooseberries in cool storage as soon as possible after picking. Interrupting storage later for a week, as is generally necessary for shipping fruit to Australia, appears to have no serious effect on keeping quality and is preferable to delaying cool storage. It is also believed by some that a period in cool storage before marketing improves the eating quality of Chinese gooseberries.

Vitamin C Analyses of Stored Fruit

It has been generally accepted that Chinese gooseberries are rich in vitamin C and this has been featured in advertising. To obtain more definite information on this point for the export market and to ascertain whether varietal differences or storage treatments affected the vitamin C content, analyses were made of various samples of fruit. The analyses included seeds but not skin.

The results confirmed that Chinese gooseberries are rich in vitamin C. The Bruno variety appears to be very rich and contained from 150 to 156 mg. per cent of vitamin C, which is more

than three times as much as is found in most citrus fruit juices. Hayward fruits contained 82-83 mg. per cent and Abbot 51 to 62 mg. per cent of vitamin C. The analyses suggested that as Chinese gooseberries mature and soften their vitamin C content increases slightly.

Despite the slightly inferior keeping qualities of Bruno observed in these investigations, the high vitamin C content of this variety may eventually prove to be a factor favouring its production.

Recommendations

In the light of present knowledge the following method of handling Chinese gooseberries for export is suggested:

● Pack only firm fruit. This is likely to be more available between late May and mid June. Use containers with polythene liners which completely envelop the fruit, but leave the envelope unsealed.

● Place the fruit in cool storage as soon as possible after picking, even if it has to be shipped to Australia later in ordinary cargo space. Hold the fruit in cool storage at 31 to 32 degrees F and at a relative humidity of 90 per cent or more during shipment and while it is awaiting sale.

● Do not store Chinese gooseberries with apples or other fruit. There is strong evidence that ethylene given off by other stored fruit accelerates the ripening of Chinese gooseberries in storage. (Ethylene treatment is sometimes used to prematurely ripen Chinese gooseberries early in the season.)

Similar recommendations are made for local cool storage of Chinese gooseberries, but if producers are not prepared to buy polythene liners, they must maintain relative humidities in storage rooms as high as possible above 90 per cent.

By following the above recommendations it should be possible to hold Chinese gooseberries successfully for 3 to 4 months or longer.

Acknowledgments

The authors are indebted to Messrs Prew and MacLoughlin Ltd., Te Puke, for the use of their cool store for part of these investigations; and to N. A. Turner, Fruit Research Station, Department of Scientific and Industrial Research, for making the vitamin C analyses.

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Resowing Depleted Tussock Land in Hakataramea Valley

By R. K. DARWIN,
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Oamaru

THE Hakataramea Valley is about 35 miles inland and extends north from Kurow for about 30 miles. On the west the boundary of the valley is the 6,000 ft Kirkliston Range, and on the east a lower range, with a highest point of 3,500 ft separates the valley from the Waihao catchment. The width of the valley varies from 2 to 7 miles.

THE soils of the valley show much variation. On the west side near the Kirkliston Range the soils are fertile clay loams and toward the centre of the valley stony alluvial flats. On the eastern side of the valley are silt loams of medium fertility, productivity being dependent on moisture.

Climate

The climate is semi-continental, being very hot in summer with temperatures reaching the nineties at times, with low humidity, and very cold in winter with severe frosts of



Improved tussock country after a severe drought.

▼ Cocksfoot and ryegrass established on a dry and previously bare face.



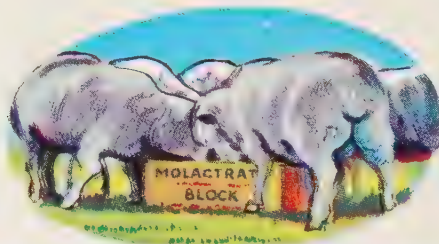
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RESOWING DEPLETED TUSSOCK LAND

20 degrees and on occasions over 30 degrees. With these extremes of temperature there is also a big variation in the total rainfall and its distribution. Near the Kirkliston Range the rainfall varies from 20 to 30 in., in the centre of the valley and on the eastern side it probably averages from 20 to 25 in., though it may be considerably less in dry years. The effectiveness of this low and variable rainfall is further reduced by the parching effect of frequent winds from the north-west, especially in spring and summer.

Vegetation

The original vegetation on the eastern side of the valley was tussock grass which formed a dense and complete cover. Grazing by sheep since the land was first settled and low rainfall and frequent drought have been responsible for considerable depletion. Other contributing factors have been severe infestation by rabbits, injudicious burning, and economic conditions. The entire vegetation was virtually destroyed over a large area, and this occurred also in Central Otago and in other parts of the Upper Waitaki.

Impressive Improvements

With the destruction of the rabbit and the subsequent use of aerial topdressing many acres of this dry, denuded ground have been oversown and topdressed. The improvements already made despite the continual struggle with frost and drought are a distinct achievement. One farmer, Mr D. D. McKenzie, of "Table Tops", has had considerable success with oversowing on his property of 5,000 acres, where the average rainfall varies from 9 to 18 in. and the altitude varies from 1,100 to 3,400 ft above sea level.

Mr McKenzie began oversowing 6 years ago on a block of ground practically devoid of vegetation. The seed mixture, consisting of 16 lb of perennial ryegrass, 1 lb of cocksfoot, 2 lb of white clover, and 1 lb of red clover (mostly seed seconds) per acre, was sown in August without fertiliser, which is not usual.

Oversowing

When Mr McKenzie started oversowing, the ground was completely bare and he considered it necessary to obtain a good strike before he topdressed it, especially in this dry region. The areas sown were lightly grazed with sheep to tramp the seed in and then spelled so that natural reseeding would result. Once a successful establishment was assured, 1 cwt of superphosphate was applied per acre in the first or second season. At present over 3,500 acres have been oversown and 1,600 acres topdressed.

By the time most of the farmers on this dry country started to oversow competition from grassy weeds was such that fertiliser was very necessary



Typical unimproved country, showing sparse tussock with scabweed and bare ground. Pegs mark a fertiliser trial in the foreground.

to ensure a reasonable establishment, and sowing with fertiliser is now the accepted practice.

From a Departmental trial of inoculated clover seed sown with and without fertiliser on a sunny face and a dark face it has been found that fertiliser is necessary to enable a quick establishment of clover plants, particularly on the sunny face, though a reasonable strike on the unfertilised dark face was obtained. However, this strike was poorer than the fertilised area on the dark face.

Moisture Factor

The productivity of any grass or legume in this area depends chiefly on moisture. With moisture practically always lacking production is normally low and 1 cwt of fertiliser will give results for 2 years or more. Mr McKenzie has been able to establish ryegrass, cocksfoot, and clovers up to 3,400 ft, the highest point on the property. Over most of his farm he has noticed an excellent response to sulphur, and now some of the topdressing programme is carried out with gypsum in place of superphosphate.

The introduction of grasses, and especially a legume, into this class of country has been an achievement. The results of oversowing can be seen in the increase in stock numbers and particularly in the big increase in wool weights and the ability of the land to fatten some lambs.

A comparison of stock carried and wool produced in 1947 and 1956 shows:

	Ewes	Hoggets	Wethers	Total sheep	Wool per sheep lb
1947 ..	700	100	200	1,000	6.3
1956 ..	800	600	450	1,850	9.3

Sheep numbers have increased by 85 per cent and the wool clip by 133 per cent.

With further oversowing and topdressing contemplated Mr McKenzie realises that to utilise these improvements fully subdivision of paddocks and blocks is necessary, and already several miles of new fencing on the improved blocks has been completed. Some cattle have been used to clean up gullies and dark faces, but their numbers will not increase greatly, mainly because of the need to provide cattle-proof fences.

Though Mr McKenzie favours ryegrass and clovers for his type of country, he has tried lucerne. However, he considers that this legume, though capable of equalling or surpassing in production a grass-clover pasture, and though more resistant to drought, needs more favourable conditions and careful management for successful establishment.

Vast Potential

The pasture that Mr McKenzie has obtained on this very dry hill country of the Hakataramea Valley is producing more than the original native cover of tussock grassland. The success of this improvement on this type of country indicates the vast potential for increased production on similar areas.

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Hormone Weedicides for Control of Ragwort on Dairy Farms

By C. R. TAYLOR,
Instructor in Agriculture,
Department of Agriculture,
Rotorua



Part of the 15-acre demonstration area before treatment.

▼ The first application of weedkiller.



LARGELY to show farmers on recently developed pumice country the efficiency of certain hormone formulations in the control of ragwort several comparatively large areas of infestation have been treated in the Whakamaru-Tihoi districts in Taupo County over the last three years. The earliest of these trials (on 15 acres) has now been ended after showing conclusively that heavy ragwort infestations on dairy farms can be brought under complete control with two treatments in the one year provided the right hormone is properly used at the right times, that is, when the growth stage of the weed, climatic conditions, and general management of infested pastures combine to favour treatment.

THE success of these trials is well illustrated in the colour and other illustrations in this article.

The upper illustration on this page shows portion of the 15 acres as it was nine months before any treatment was applied. At this time the settler, a rehabilitated ex-serviceman, was attempting control by pulling and mowing at a somewhat more advanced stage than that illustrated. He had also used sodium chlorate without very much permanent success.

The lower illustration shows part of the same area nine months later, that is, in mid August 1956, when the first treatment, butoxy ethanol ester of 2,4-D at 1 lb of acid equivalent per acre, was being applied. The dead ragwort flower stalks of the previous season's growth are still clearly visible.

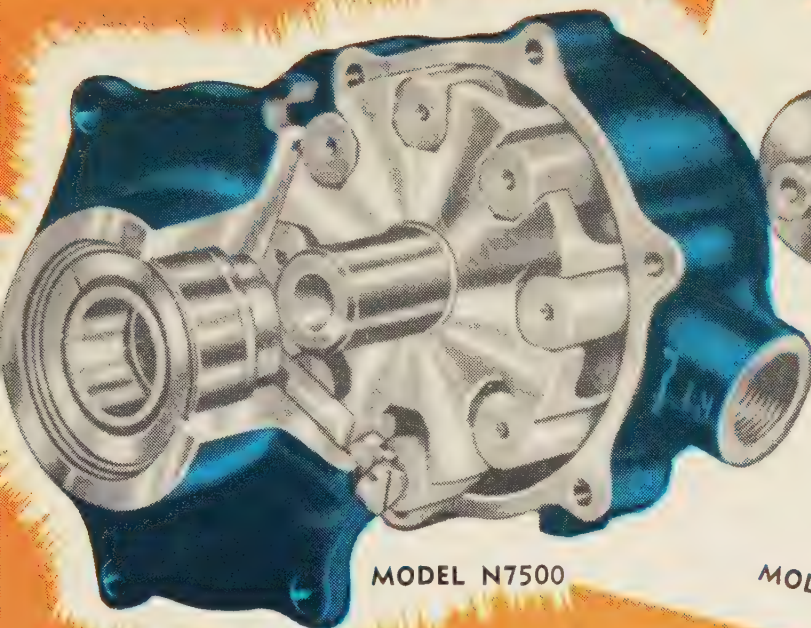
The main purposes in spraying with hormone at this period were to take full advantage of the short pasture growth in facilitating complete coverage of the young seedling and root-growth ragwort plants so prominent at this time, and to minimise clover damage, as white clover was not growing actively at this period.

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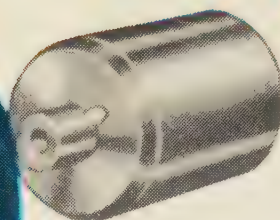
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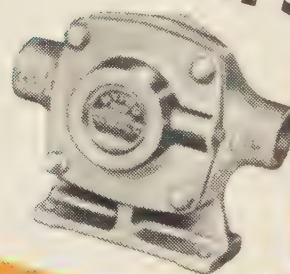
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Young Plants Destroyed

Very little growth was evident in the older plants in August and it was known that these would require attention a few months later. An excellent kill of young plants followed this treatment.

Equipment Used

After the successful treatment of seedling and root-growth ragwort in mid August mature plants and any seedlings and other growth that may have escaped treatment at the previous application were sprayed in mid November. On steep hillsides older ragwort has been sprayed through a 13 ft man-handled boom supplied through a long lead of hose from a tractor-driven pump. This is a very rapid and efficient method of treating ragwort, thistle, etc., on country that is too rough and dangerous for mechanised units to traverse but that does not entail heavy work for the operators. Siting poles are desirable, however, to indicate sprayed and unsprayed areas.

It is imperative at this mid-November spraying that pasture growth be eaten down as short as possible with cattle (not sheep) to expose the maximum amount of ragwort leafage to the hormone spray.

A small, easily portable petrol motor and pump (see illustration on page 25) for use with the same 13 ft boom is an excellent alternative to a tractor-driven pump either where a tractor is not available or to obviate the need

HORMONE WEEDKILLERS CONTROL RAGWORT



This paddock once covered with vigorous ragwort is now free of the weed.

▼ The damage to red clover by weedkiller in the pasture at right contrasts vividly with the growth in the untreated sward at left.

for extra-long lengths of hose. This method of spraying is fast, efficient, relatively cheap, and especially suited to difficult terrain. It was used extensively on this demonstration area.

On the easier parts of the demonstration area a tractor fitted with a front-mounted boom was used as shown in the lower illustration on page 25. The boom, 12 ft long, is of the articulated type, facilitating easy storage when not in use, convenient transport from place to place on the farm when in use, and adjustable to reasonable hillside operation in certain circumstances.

Successful Results

After nearly two years from the initial spray treatment in mid August (followed by a second and last treatment in mid November of the same year) only very isolated ragwort plants remained.

The hillside paddock in the upper illustration on this page was once covered with vigorous ragwort, but the weed has now been eradicated.

A hormone formulation of butoxy ethanol ester of 2,4-D used at 1 lb of acid equivalent per acre (about 2½ pints) in 20 gallons of water caused this spectacular transformation. Pumps were adjusted to deliver solution at jets (fan 32) at a pressure of 35 lb per square inch, while the speed of travel of both tractor and hand-boom operators was about 3 to 4 miles per hour.





Vision...

The prosperity of New Zealand stems largely from the vision of its farmers who enjoy a world-wide reputation for adaptability and progressiveness. Improved farming techniques increase the productivity of the land but also, in some cases, accentuate the hazards of stock disease. New Zealand farmers have been quick to take advantage of new methods of disease control by vaccinating their stock against such ailments as pulpy kidney, blackleg, contagious abortion, distemper; and the Tasman Vaccine Laboratory Limited, is proud to be associated with them in their endeavours.



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HORMONE WEEDKILLERS CONTROL RAGWORT

For both sprayings the total man hours required to cover 15 acres twice worked out at 45 or one and a half hours per acre. Total hormone weed-killer used per acre (two applications) was a little over 2 lb acid equivalent per acre. The final cost was therefore quite low compared with the results achieved.

The weather just before the first spraying (mid August) had been fairly dry and warm for several days and these conditions continued for a few more days except for a short but heavy shower on part of the hillside area some hours after treatment. It appeared to have no adverse effect on the final result, however. For the second and final treatment in mid November fine, hot, humid conditions prevailed.

A similar demonstration to that described above (on about 35 acres) showed clearly that sheep do not control ragwort rapidly and efficiently. A new pasture **purposely grazed only by cattle** and originally infested with ragwort was treated in mid November and spot sprayed as necessary in the following February and was virtually cleared of ragwort, whereas a similar young pasture which was grazed by both sheep and cattle but not otherwise treated had a mass of flowering ragwort in late March. Hot, humid weather with short showers was experienced during treatment. No ill effects were noted. This trial is continuing.

Damage to Clovers

There is always a possibility of some damage to clovers when many of the hormone weedkillers are used, and this is a risk that must be accepted whenever it is desired to eradicate certain troublesome, resistant weeds. In this respect the ester preparations of 2,4-D, even when used at low concentrations as in the demonstrations described, can damage young red clover plants and slightly affect white clover. The same clover species in an



This 13 ft man-handled boom can be used with a long hose from a tractor-driven pump or, if a tractor is not available and to avoid the need for an extra-long hose, with a small, easily carried petrol motor and pump as shown.

older pasture may be checked somewhat but seldom destroyed. The lower illustration on page 23 clearly shows the damage resulting to red clover in a young pasture (right), which contrasts vividly with the untreated sward at left. This is not the 15-acre block described previously.

On pumice country, except perhaps the droughtier types, where red clover is an important element of a pasture and should be protected against damage as much as possible, this obviously severe check to red clover could ultimately prove a blessing, for white clover and ryegrass are given a chance to become thoroughly established without the usual severe competition from the coarser and more vigorously growing red clover. In the initial stages, however, carrying

capacity could be affected for a short time, but finally a higher producing, better balanced, and less bloaty pasture could well follow the hormone treatment.

In these demonstration trials another form of 2,4-D (amine salt) was also used as a comparison with the butoxy ethanol ester 2,4-D, and though its effect on clovers was less pronounced, its effect on ragwort was most disappointing.

In these circumstances—at least at present—the farmer's choice of hormone weedkillers would seem to be governed (1) by the earnestness of his desire to eradicate such weeds as ragwort in the shortest possible time while accepting some degree of clover damage, or (2) by his fear of unduly harming his clovers and making the job an expensive and long drawn-out one through using less efficient hormones.

These large-scale demonstrations prove that ragwort control with suitable hormone weedkillers is both practicable and relatively inexpensive. Given reasonable weather conditions, pasture management designed to expose the maximum amount of ragwort leafage to the action of the weedkiller, and subsequent maintenance of high fertility, there should be little doubt concerning the efficacy of the treatment, especially on dairy farms, where sheep usually are a poor investment for ragwort control.

Acknowledgment

To the Manson bros. for the use of some of the photographs reproduced in this article, and for carrying out the work recorded herein. To Mr H. C. Page and the Department of Lands and Survey for the use of their properties and cooperation received.



On the easier parts of the demonstration area a tractor with a 12 ft boom fitted in front was used.

Care of Livestock during August

Contributed by the Animal Research Division

COWS about to calve should be brought into a handy paddock so that they can be kept under supervision. If a cow has difficulty in calving, veterinary assistance should be sought. This should be done as soon as it is obvious that the presentation is not normal and always within six hours of the beginning of labour. Unskilled interference exhausts the cow and makes the veterinarian's task more difficult or even impossible. Veterinary assistance should also be sought if the cows do not clean within 48 hours. Do not hang weights on the afterbirth.

CARE OF CALVING COWS

Autumn-saved pasture is the best food for newly calved cows, but it must be grazed in small breaks which the cow will clean up in about two hours. They should continue to receive as much silage as they will eat, and if the pasture is short and sappy, they should also receive hay.

FEEDING AFTER CALVING

Calves should be fed their own mothers' milk for at least the first two days. This is important, as the first milk, known as colostrum or "beastings", contains substances which increase a calf's resistance to scours. Jersey calves need 7 pints daily of whole milk for two to three weeks, and thereafter this quantity or its equivalent in skim milk, namely, 2 gallons, will suffice until the calves are weaned. As soon as calves are proficient bucket feeders the above quantities can be fed once a day. If scours occur, a supply of a sulphur drug should be obtained from a veterinarian immediately, as the drug is very efficient when used promptly. Calves should not be kept in a calf paddock. When two to three weeks of age they should be rotationally grazed ahead of the cows. This will ensure that they always have access to good, fresh pasture, which they will eat readily. Where good pasture is available calves can be weaned quite satisfactorily at eight weeks. Further information about the good rearing of dairy stock is contained in Department of Agriculture Bulletin No. 228, "Good Rearing of Dairy Stock".

The full sisters of high-producing heifers should always be kept, as should the daughters of Merit Sires with a high progeny test. Provided they are sturdy, the calves of very old cows with good lifetime performance should always be kept, and there is no reason why the calves of well bred heifers should not be kept. The heifer twin of a bull calf should never be kept. Twin heifers may be kept with safety, provided they are not too small, especially if they are born early in the season.

SELECTION OF CALVES FOR REPLACEMENT

If calves are being lost from redwater (leptospirosis), a veterinary surgeon should be called to treat affected animals and to advise on prevention of further losses by the use of protective serum or vaccination.

REDWATER IN CALVES

Milk from each quarter should be examined with a strip cup before milking. If it shows any abnormality, or if the udder appears inflamed, treatment with penicillin should be given at once. Three tubes of 25,000 units should be injected at 24-hour intervals, even if the milk appears normal after the first tube. Prompt treatment early in lactation will often save a quarter which otherwise might become weak or even blind.

MASTITIS

If difficulty was experienced in getting cows in calf last summer, now is the time to seek veterinary advice so that similar trouble this year can be prevented. Facilities for diagnosing infectious infertility are available at the Wallaceville and Ruakura Animal Research Stations. Specimens must be submitted through veterinarians or Livestock Instructors. Effective control depends on accurate diagnosis.

Calves and yearlings may become very lousy during late winter and early spring. Control can be effected by the use of suitable dips, sprays, or washes. Those containing DDT, BHC, dieldrin, aldrin, or diazinon are most effective. Repeated treatments may be necessary, as the eggs are difficult to destroy.

LICE ON CALVES

About 10 per cent of all lambs are either born dead or die during the first week. These losses can be reduced by careful shepherding. Many lambs and some ewes can be saved by skilled assistance during lambing. Always use a reliable lubricating antiseptic on hands and wrists. Faulty presentations must be corrected. A lamb should never be forcibly pulled away when a leg or the head is turned back. A number of lambs die from suffocation through the cleanings remaining over their nostrils; these are very easily removed. Where necessary lambs should be assisted to get a drink. This is particularly important where ewes have very large teats. Drawing away a few squirts from these will reduce their size and enable the new-born lambs to suckle. Ewes with very large teats, very small teats, badly placed teats, or defective udders should be marked for culling. A big percentage of their lambs will die. Many lambs which die during cold or wet weather would survive if they got a good drink soon after birth.

CARE OF LAMBING EWES

Vitamin D, known as the rickets-preventing or sunshine vitamin, is essential to young chicks for normal bone development during the brooding stage and afterward as growing stock if they are kept in a house on the intensive system. Under normal brooding conditions, even where chickens may be exposed to sunlight from time to time, it is desirable to include vitamin D in the chicken mash. This may be done by incorporating a suitable fish liver oil or one of the synthetic additives rich in vitamin D now readily available. Buyers of the commonly bought ready-made chick mashes should ascertain whether they contain a proper quantity of added vitamins A and D. Most mash manufacturers do include vitamins A and D in their chick mashes.

Where fowl pox has occurred on a property in the previous autumn or winter all chickens should be vaccinated with fowl pox vaccine between the ages of eight to 12 weeks. Birds should be in good condition and should have been dewormed before vaccination.

FOWL POX

During recent years there have been a number of outbreaks of "Q" disease of which the main feature is sudden deaths of well grown chickens between the ages of 10 and 32 days. Though the cause of the condition is not known, affected chickens have responded to 2 per cent of molasses in the drinking water. If losses are occurring at this time, consult your local Poultry Instructor.

"Q" DISEASE OF CHICKENS

Pasture and Crop Production

Seasonal Notes by the Extension Division

CONSIDERABLE attention has been paid to the improvement of tussock grassland in the last few years. One of the most striking discoveries has been that the best results from oversowing clovers have been secured when this has been done in winter.

PASTURE OVERSOWING ON TUSSOCK COUNTRY

JUNE, July, and August are the most reliable months to oversow clovers into tussock country, but oversowing may be extended into September in some of the wetter and colder areas. Seeding rates need not be high, provided the correct fertiliser is used, and many dense clover swards have been established with only 2 lb of white clover and 2 lb of Montgomery red clover per acre. Alsike at 1 lb per acre may sometimes be included.

The South Island tussock country is generally highly sulphur deficient, and ordinary superphosphate will not supply enough sulphur to correct this when applied at the usual rates. Sulphur-enriched superphosphate is, however, now available in two mixes, one of 400 lb of added sulphur per ton of mix and one of 224 lb per ton. The mix required should be stated when the superphosphate is ordered.

Most tussock country is also phosphorus deficient. The relative importance of sulphur and phosphorus on the particular area to be topdressed must be established. Local Department of Agriculture instructors may be able to provide this information.

Molybdenum is also useful over a wide range of this country and should generally be included in the initial sowings. All clover seeds should be inoculated when there is no clover already present in the pasture.

Grasses do not establish readily in these initial oversowings and, in general, the inclusion of more than 2 to 3 lb per acre of cocksfoot is rarely warranted.

It should not be difficult to introduce higher producing grasses three years or so after establishing the clover, when the nitrogen status has been raised sufficiently.

—R. L. BENNETTS, Christchurch

WHEAT VARIETIES FOR THE NORTH ISLAND

THE wheat varieties grown in the North Island do not vary greatly from district to district. It is nevertheless important that wheat growers select the most suitable variety for their locality.

About 12,000 acres of wheat are grown in the lower half of the North Island. In each of the three districts—Manawatu, Rangitikei-Wanganui, and Hawke's Bay—from 3,000 to 3,500 acres are grown, with about half that area in the Wairarapa district.

RANGITIKEI- WANGANUI

Tainui and Gabo are recommended for the Rangitikei-Wanganui district. Gabo gives good yields on a wide range of soil types. However, its tendency to sprout after rain at harvest time makes it advisable for a farmer to have his own header. Aotea has not yielded well in field trials. Wheat crops should be sown early in September.

HAWKE'S BAY In Hawke's Bay Aotea, Gabo, and Tainui are the most suitable varieties. Gabo has some excellent qualities, but sprouting in the ear has caused considerable concern. Aotea has yielded extremely well in field trials and it promises to be a good replacement for the other varieties. Varieties are mainly spring sown.

WAIRARAPA For spring-sown crops in the Wairarapa Aotea is recommended, provided it can be sown in August or early September. For later sowings Tainui or Gabo is recommended. Tainui is grown mainly on heavy clay soils, while Gabo is confined more to freer-draining soils. For sowing in May or June Aotea or Cross 7 should be used.

MANAWATU The spring-sown varieties Gabo and Tainui are recommended for the Manawatu. Tainui is susceptible to lodging and fungous diseases, which reduce yield. Gabo is susceptible to sprouting in the ear, which affects seed quality, but otherwise it yields well. Lines of seed as free as possible of loose smut should be used. In field trials Aotea has not produced yields as high as Gabo or Tainui.

—A. K. BOOTH, Wanganui

HARROWING OF PASTURES

IT is neither necessary nor advisable to use drastic penetrating harrows on pastures with the idea of improving the sward. Harrowing, which cuts up the surface of the ground, does not make the grasses and clovers grow any better, but it provides a good seedbed for weeds to establish in. Penetrating harrows are sometimes used on tight, root-bound swards to get a suitable seedbed on which to sow better pasture species, but it is generally much more profitable to spend the time and work necessary to get a satisfactory seedbed on such areas in ploughing, cultivation, and reseedling.

HARROWING TO SPREAD DROPPINGS

The only really worth-while use of harrows on pastures is to spread animal droppings when these are too firm to be readily broken up by the sward. When such droppings are undisturbed, most of their considerable manurial value is wasted, being washed into the soil, and the pasture plants beneath the droppings are killed. They are replaced by inferior grasses such as browntop and Yorkshire fog or by weeds.

The best type of harrow for the job is the ordinary chain or chain and light tripod harrow, which does no more than break up the droppings and spread them. The harrowing is best done when the droppings are wet and before they have been lying long enough to damage the sward. On most high production, heavily stocked dairy and fattening farms the strong growth of pastures will break the droppings quickly at most times of the year, but there are still many farms where harrowing to spread the droppings is well worth while, especially in autumn and early spring.

—M. K. HOLLAND, New Plymouth

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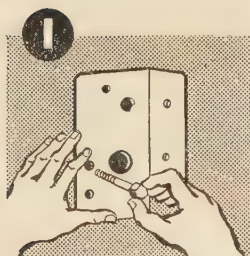
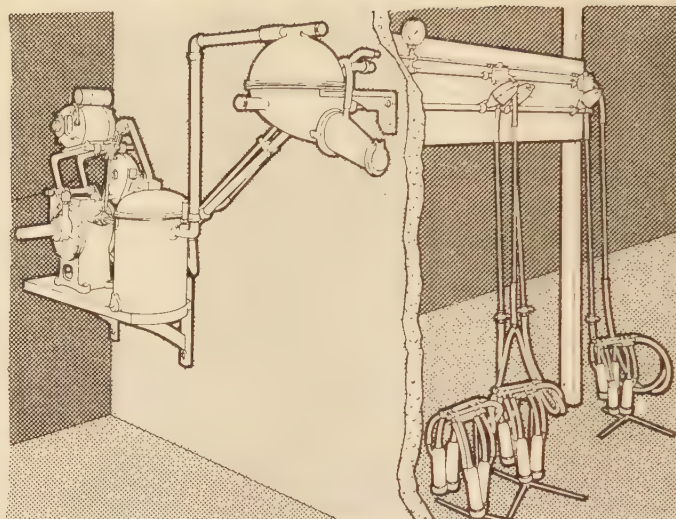
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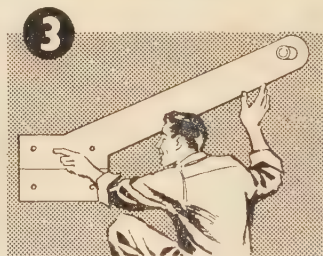
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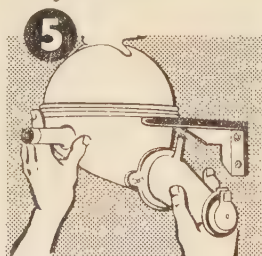
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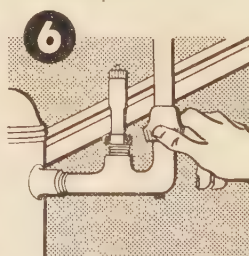
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Cleaning Farm Vats Used for Tanker Collection of Milk

WITH the more general change-over to tanker collection of milk from milk supply dairies some problems have arisen with the cleaning of farm vats. How to keep these vats sanitary is outlined in this article.

WITH reasonable care a stainless-steel surface is easy to clean and keep sanitary, but with improper cleaning insanitation and consequent deterioration in milk quality will develop.

The way the vat is set up affects the ease and efficiency of daily cleaning. The stand must extend a minimum of 18 in. beyond the circumference of the vat. Overhead clearance is also important and a minimum of 4 ft between the top of the vat and the ceiling is necessary. Good drainage from the stand and steps should be provided to carry away wash water.

Doors should protect the vat from the direct rays of the sun. If the sun strikes the vat, even after milk has been collected and before the vat is washed, milk deposits will harden and be difficult to remove.

Cold water connections should be made on the stand and a hose provided for rinsing the vat as soon as possible after the milk is collected. Hot water facilities may have to be increased with the installation of a vat, as enough hot water for thorough cleaning is essential.

If the inside of the vat cannot be conveniently reached with a brush from floor level outside the vat, movable steps should be provided; or a permanent railed platform can be fitted round the outside and about 2 ft from the top of the vat. The wall and bottom can thus be easily reached with a scrubbing brush and the vat kept perfectly clean. To improvise with cans or boxes is not only dangerous but wastes time.

The following brushware is required for thorough cleaning of the vat:

1. A good dairy scrub for general cleaning.
2. A soft-bristle brush on a handle for cleaning the inside surface.

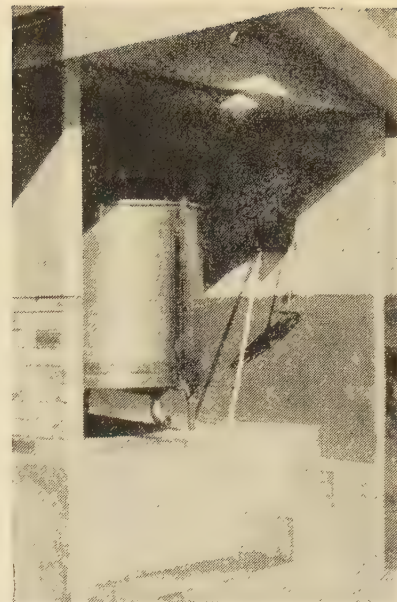
3. A down dropper brush for the measuring tube and connecting tube to the vat.
4. A claw brush for the tap and gland.
5. A large spout brush for the gullet and bend.

By M. J. McFETRIDGE,
Supervisor of Farm Dairy
Instruction, Department of
Agriculture, Hamilton

A good detergent is necessary for cleaning the vat. If caustic soda is used, the addition of a wetting agent will assist, particularly if the water has a high mineral content. Detergent solutions should be used at the same strength recommended for cleaning milking machines. The quantity required will depend on the size of the vat, but four gallons would be sufficient for a small vat.

The recommended method for cleaning vats is:

1. Immediately after the milk has been collected rinse the vat thoroughly with clean cold water.
2. Close the spinner valve or tap.
3. Wash the inside of the vat with the detergent solution, paying particular attention to the underside of the bridge, lids, and rod connection to the spinner valve.
4. Loosen the bend connection at the gullet and measuring tube unit.
5. Clean the measuring tube by filling it with detergent solution and brushing with a soft brush.
6. Turn the bend to discharge away from the front of the stand and open the spinner valve.
7. Raise the spinner valve and clean the underside. Remove the bend and



This farm vat has ample clearance above and around it for ease of cleaning and has a sloping stand with sloping steps to allow thorough drainage away of washings.

clean it with a spout brush; attention must be given to the rubber rings.

8. Remove the measuring tube tap and brush the pipe to the vat; dismantle the measuring tube gland and clean the gland and rubber ring.

9. Clean the outside of the vat with detergent solution, particularly the top of the bridge and the lids; also underneath the vat.

10. Rinse the inside of the vat and all parts thoroughly with hot water.

11. Leave open the measuring tube gland and tap, the bend of the spinner valve, and the lids to dry thoroughly.

12. After the vat has been assembled before milking it should be thoroughly rinsed with clean cold water direct from the hose. All water must be drained from the vat before the valve is closed.

If the above procedure is followed, there should not be any build-up of milkstone, but some hard waters may in time leave a film. This can be removed with a weak acid solution. Your Farm Dairy Instructor will advise on what type of acid and how to use it.

Tanker collection of milk offers many advantages to milk suppliers, but adequate cleaning of the vats is imperative. Even if the milking machine and other utensils are in first-class sanitary condition, storage of milk in a vat which is not thoroughly clean might result in rapid deterioration in quality and down grading of the produce.

Automatic Control of Trickle Irrigation

By M. G. BAUMGART,
Storage Specialist,
Department of Agriculture,
Wellington

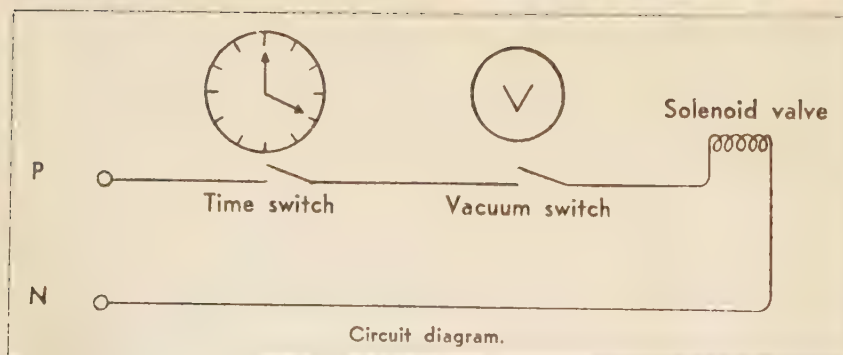
A SIMPLE method of automatically controlling trickle irrigation to help reduce to a minimum the supervision required, especially during weekends and holidays, is under trial at the Department of Agriculture's Horticultural Research Station, Levin. The switch and the auxiliary equipment used in the trial are described in this article.

THE unit installed for trial during the 1958-59 season supplied water only, though there appears to be no reason why nutrients also could not be supplied if lines were occasionally flushed with water to free them of algal growths. Whether this growth would be sufficient to cause blocked nozzles is to be investigated later.

Use of Vacuum Switch

As watering on the Station is applied according to soil tensiometer readings, the principle adopted for the control was to have one or more tensiometers operate a vacuum switch, which in turn operated a solenoid valve (see circuit diagram). As there

← Layout of equipment used in the trial. A—Time switch. B—Tensiometer switch. C—Solenoid valve. D—Lamp indicating when switch is "on" (an experimental check).



were no industrial types of vacuum switches available which would operate within the required range and have a sufficiently small differential, it was decided to make one.

The body and switch mechanism from a thermostat was available. The bellows and capillary tube were removed and a nipple soldered to the base of the bellows housing to enable the tube from the porous pot to be attached. A rubber diaphragm was then sealed in between the bellows

AUTOMATIC CONTROL OF TRICKLE IRRIGATION

housing and the switch frame. A short brass rod was fixed to the centre of the diaphragm and pinned to the switch operating lever.

Spring Strength

The original springs were removed from the switch and $\frac{1}{2}$ in. diameter weak coil springs attached to the moving saddle and to the diaphragm pin, one on each side for balance. The spring strength required was selected by operating the switch with a vacuum pump. Springs which enabled adjustment from a vacuum of 5 cm to 16 cm of mercury and which gave an operating differential of 2 cm were finally fitted (see switch drawing).

The rubber diaphragm gave trouble and was replaced with a petrol pump diaphragm which has operated satisfactorily for the season. Care must be taken to ensure that no air is trapped in any part of the pot or bellows housing, as the switch will then not operate satisfactorily. Both switch and pot are carefully filled with water by use of the tensiometer filling bottle before the two are joined.

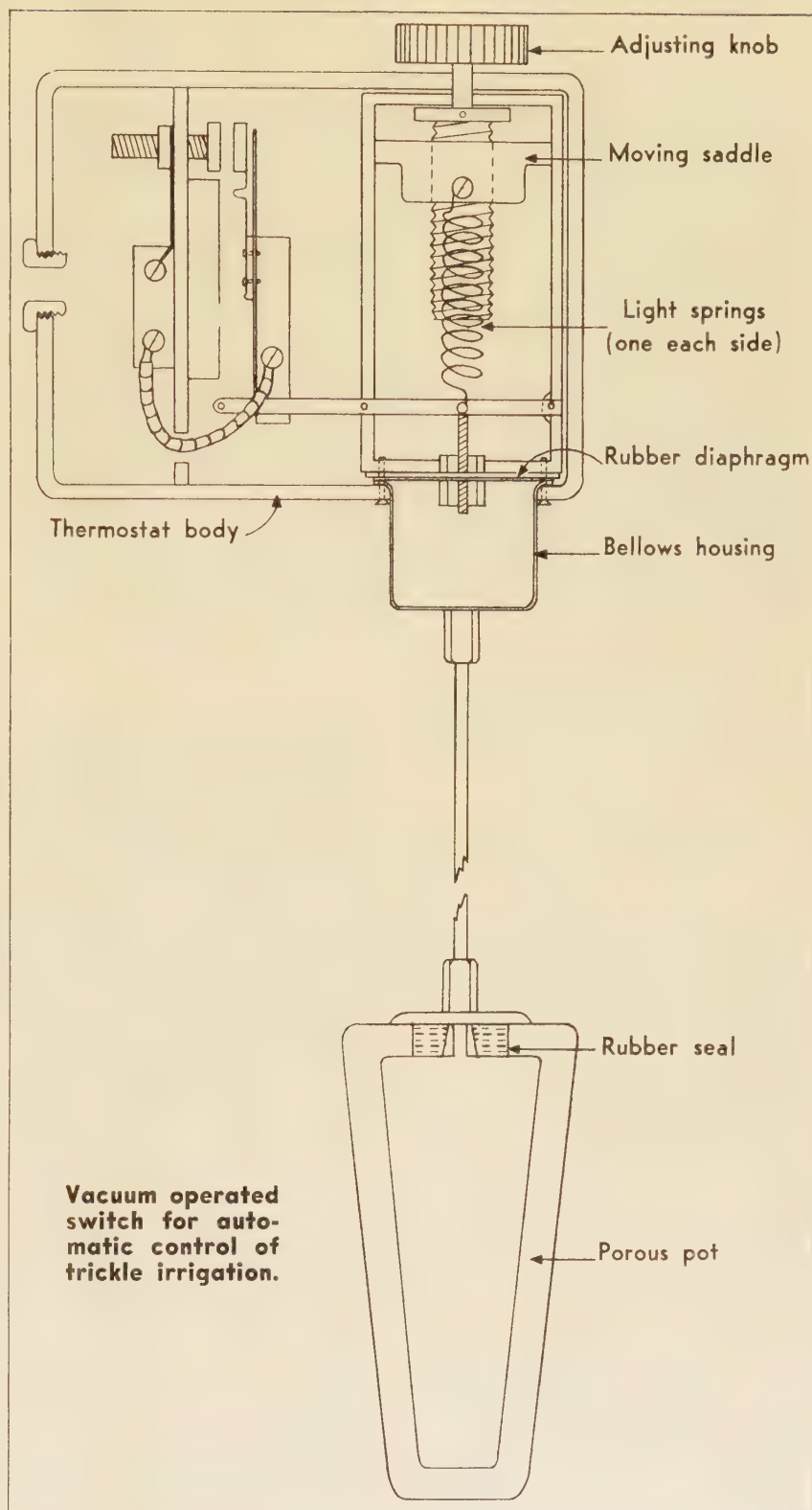
The Levin trial is small and the control is limited to one switch, but when a full glasshouse is run under automatic control it is intended to have two or three switches wired so that any one may start the watering.

Overall Control by Time Clock

As the reaction rate of the ceramic porous pot is slow, which may be an advantage with trickle as against low level sprinklers, an overall control is supplied by a time clock. This is set to come on for half an hour or an hour twice a day. If the vacuum switch is also on, watering then occurs for the period set.

If the plants are using water rapidly, a further supply may be given later provided the vacuum switch has closed again. The periods at Levin are set at 8.30 a.m. and 1.30 p.m. The half-hour period (with the 8 ft head of water) will supply approximately one pint per plant and this appears sufficient unless the plants are extremely large and well leafed.

When more switches are made to enable a 100 ft by 30 ft house to be operated automatically, it is intended to use thermostat bodies incorporating mercury switches rather than silver contacts and brass bellows type diaphragms.



Mucosal Disease

Control Procedure Modified

PROCEDURE for the control of mucosal disease in cattle has been modified by the Department of Agriculture as a result of information accumulated since the disease first occurred early this year. The Department is now quarantining only properties on which the disease occurs.

AT the time this article was prepared quarantine had just been removed from the farm at Martinborough and was about to be removed from the farms at Waipukurau and Palmerston in the South Island.

Early Fears Not Substantiated

When the first outbreaks occurred the symptoms and course of the disease, though conforming with reports of mucosal disease in other countries, had some features which were not typical and the possibility of a virulent variant of the disease had to be guarded against. Accordingly very strict quarantine measures were adopted. Thorough tests were made continuously for some weeks after the first outbreak, including the introduction of test cattle to infected properties. Evidence from this experimental work, trials at the Wallaceville Animal Research Station, and detailed field observations did not indicate the existence of a virulent form of the

disease. Experience also suggested that the disease was not readily transmitted between adjacent farms or from one district to another.

Sixth and Seventh Outbreaks

Last month's "Journal" referred to the five outbreaks which had occurred up to the time that issue went to press. Subsequently there was an outbreak in the Martinborough district of the Wairarapa and another at Palmerston in Otago. The latter has been the only case so far proved positive in the South Island.

In both these outbreaks only infected properties were isolated. More rigorous measures designed to prevent the disease occurring elsewhere seem to be unjustified in view of the essentially sporadic nature of the disease.

Further Outbreaks Still Possible

Fresh outbreaks could occur, and if they do, infected farms will be quar-

antined. Animals showing definite symptoms of infection will be slaughtered and compensation paid. The remaining animals will be held in quarantine for three weeks. If no further cases develop, restrictions will be removed. The quarantine will apply to cattle only, and during the quarantine period they may be removed from the infected farm only on a permit and for immediate slaughter.

Control measures, though modified, are as stringently thorough as later knowledge of the disease appears to warrant, and once an infected property has passed through the quarantine period normal activities can be fully resumed. The Department of Lands and Survey which normally buys a substantial proportion of its annual requirements of breeding stock in the Wairarapa, where most of the outbreaks of mucosal disease have occurred, intends to buy its usual quota of beef bulls and rams there in the coming season.

Need for Continued Study

Full investigation of mucosal disease as it occurs in New Zealand will proceed. The two scientists who made a special visit to the United States to study mucosal disease there, Mr R. M. Salisbury and Dr L. B. Fastier, found that there appear to be slight differences between the symptoms and course of the disease in the U.S.A. and as it has occurred here.

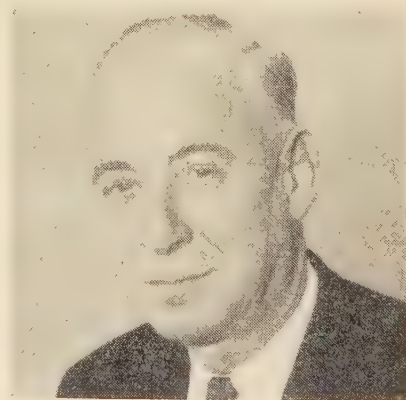
International Importance of Animal Health

U.S. Specialist's Discussions in New Zealand

IN New Zealand recently after attending the Australian veterinary conference in Brisbane was Dr L. C. Heemstra, Director of Animal Inspection and Quarantine in the United States Department of Agriculture. Dr Heemstra visited animal research institutions here and discussed with veterinarians and other officials research and animal health regulatory activities and other matters of common interest in the protection of animal health.

Dr Heemstra, a graduate of Iowa State College, has been 25 years with the United States Department of Agriculture. His research activities included principally inquiry into poultry diseases.

"The health of livestock is extremely important in the national economy of both the United States and New Zealand", said Dr Heemstra during discussion with officers of the Department of Agriculture in Wellington, "and only by maintaining our livestock population free from diseases of foreign origin, which both countries are doing, can movement of animals and products between our two countries be maintained".



Dr Heemstra.

The seriousness with which protection of livestock health is regarded in the United States is evident in the complete jurisdiction Dr Heemstra has over all imports and exports of livestock and livestock products and the production and distribution of all veterinary vaccines, as far as these activities affect or are likely to affect animal health in the United States.

Commenting that "our traditional policy is not to live with a disease if we can do something about getting rid of it", Dr Heemstra discussed quarantine and disease control measures in the United States. Though his visit was not connected in any way with the incidence of mucosal disease in New Zealand, he had discussions in the United States with the two New Zealand scientists, Mr R. M. Salisbury and Dr L. B. Fastier, who were investigating diagnosis and control of the disease there, and with Mr I. G. Watt, who recently investigated meat inspection and handling methods in North America.

"Mucosal disease occurs only sporadically in the United States," said Dr Heemstra, "and the policy is to assist herd owners with diagnosis and in most cases to recommend disposal of affected herds and restocking of the property after some months."

The conditions under which living animals may be accepted into the United States were discussed with Dr Heemstra, who said that the only limitations to such importations were the health of the stock coming in and requisite disease-free conditions in the country of origin. Apart from this, market prospects would be the only other limiting factor.

Management of Pigs in July and August

MANAGEMENT of pigs in July and August on

- (a) dairy farms on which sows farrow in May and June, or two months before the dairy herd begins to calve, and
- (b) dairy farms on which sows farrow at the end of July and in August, when the dairy herd is calving

is dealt with in this article by I. H. Owtram, Extension Officer in Pig Husbandry, Department of Agriculture, Wellington.

THE importance, if the greatest net return is to be gained from the dairy by-product fed, of farrowing sows on a dairy farm two months before the dairy herd begins to calve, was shown in an article in the May issue of the "Journal". An actual example of the success of this policy on a farm on which it was carried out was given in the June issue. Extremely satisfactory returns from pigs on this



Young pigs should be let out for a run in clean paddocks whenever the weather is suitable.



Newly weaned pigs foul their sleeping quarters if they are cold.

farm showed that the policy was both practical and profitable.

However, farrowing sows at the correct time will not produce results unless the management of the pigs right through to the time they are disposed of is also correct. What management do they require during July and August?

Weaning

Litters farrowed in May and June will have reached weaning stage if they are normally weaned at eight weeks old. Weaning is a very critical period for young pigs, especially at this time of year, when cold and probably wet weather can be expected. Far too many litters of pigs suffer a check at weaning that is unnecessary because it can be avoided by a little care and attention by their owner.

Weaning should be carried out by removing the sow from the litter and leaving the litter in the farrowing quarters for a week to ten days. The pigs must sleep warm and dry and, as they have lost the warmth of the sow, should be provided with bedding (straw, shavings, or hay).

To prevent incessant fouling and wetting of the bedding the floor area in the sleeping compartment should be reduced by an open frame of timber or a rail placed across the floor or diagonally across a corner. The bedding should be placed in this frame or behind the rail. If the space provided just comfortably holds the pigs when lying there, very little fouling of the bedding will occur. Young pigs

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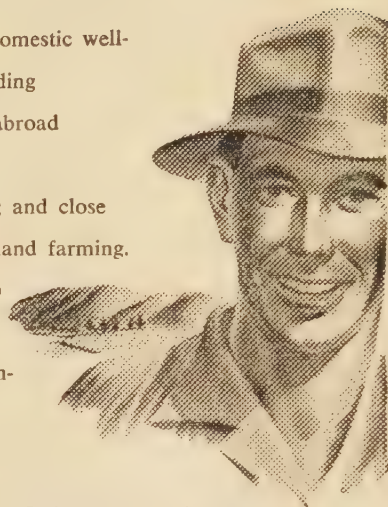
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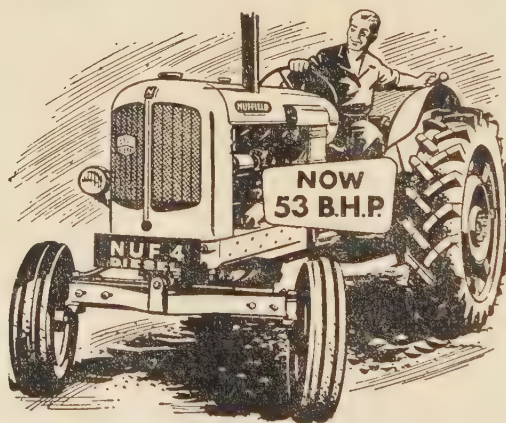
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foul their sleeping quarters mainly because they are cold.

Correct feeding at this stage is of the utmost importance. Newly weaned pigs cannot thrive satisfactorily on skim milk alone, much less on whey. A weaner should be about 40 lb live-weight and requires two food units a day to make good growth.

A food unit is one gallon of skim milk or its equivalent in meal or other food. If the pig is fed skim milk only, as it too often is, it would have to consume 2 gallons, or half its own weight, every day to obtain sufficient for its requirements. This is a physical impossibility, as anyone who considers the relative bulk of a weaner pig weighing 40 lb and 2 gallons of skim milk can see. The position with whey alone is far worse, as 3 gallons of whey are required daily, or three quarters of the weight of the pig.

In addition neither skim milk nor whey is a balanced ration for young pigs, which makes matters even less satisfactory when nothing else is fed.

Meal Supplement

A meal supplement is absolutely essential for weaners. At least 1 lb of meal per pig should be fed every day. A satisfactory mixture is 1 part of meat meal, 1 part of buttermilk powder, and 8 parts of barley meal. This mixture should of course have been fed in the creep to the pigs since they were a month old.

If meal was fed in a self-feeder in the creep, this method should cease when pigs have been weaned, as to continue *ad lib.* meal feeding is wasteful. The meal should be fed either dry in a trough or mixed to a thick slop with a little skim milk. Feeding can be reduced to twice daily after weaning, trials having shown that there is no advantage in feeding more often.

The quantity of food fed per day should not alter with the number of feeds. The best way of feeding the meal ration is probably to feed half of it at each feed and to give it to the pigs before they get their skim milk or whey. It will only take them a short time to clean it up and none is wasted.

As the pigs grow they require more food, and this is given by increasing the quantity of skim milk or whey, the meal ration remaining the same. For example, pigs weaned at eight weeks old weighing 40 lb require 2 food units and this is fed as 1 lb of meal mixture and 1 gallon of skim milk per day. At three months old the same pigs should weigh 70 lb and will then require 3 food units; this is

MANAGEMENT OF PIGS IN JULY AND AUGUST



Restricting the sleeping area by an open frame with bedding in it helps to prevent fouling.

fed as 1 lb of meal mixture and 2 gallons of skim milk per day.

Use of Tallow

Even when fed as stated and kept warm, pigs tend to "wilt" after weaning and lose the bloom they had when being suckled. This can be avoided by the use of a little tallow. About 1 oz of tallow a day should be fed to each pig in the creep from a week before weaning. The object of this is to get them used to it. At weaning the amount may be gradually increased to 4 oz daily and continued for the next six weeks. The tallow, which must be free of salt, can be fed quite simply by throwing it on to the floor of the feeding yard. Meal may be reduced by 2 oz for each increase of 1 oz in tallow fed. The cost of the fat is no greater than when a supplement of meal only is used, but the condition of the pigs is remarkably improved.

Litters should be let out during July and August for a run on clean clover pasture during the day whenever the weather allows. This is invaluable for keeping them in good condition.

It is the falsest of false economy not to feed meal to pigs during the first four months of their lives. Referring again to the article in the June issue of the "Journal", it will be seen that

on the farm quoted $8\frac{1}{2}$ cwt of meal was used per year for each breeding sow kept. This works out at $\frac{1}{2}$ cwt of meal to each pig sold, a reasonable and entirely economical quantity, and it was fed to the pigs at the right time, that is, during the first three and a half months of their lives. This system gives plenty of strong, well grown pigs to deal with the rapidly increasing supply of skim milk in spring.

July and August Litters

Those who have not yet discovered the advantages of farrowing the first sows two months before the dairy herd begins to calve will have sows farrowing now and in August, and in all probability there will be a number of store pigs on hand that have been wintered more or less on a maintenance ration.

These store pigs will be between five and six months old and will require very careful feeding if they are not to finish up as overfat baconers. On no account must they be overfed; their skim milk ration should be not more than 6 gallons a day. Where skim milk is used there is no advantage in feeding meal, but meal at 1 lb per pig per day should supplement whey feeding.

The profit on these pigs, if any, will not be very good, though some people



Sows should be placed in their farrowing quarters at least a week before farrowing. It is a mistake to wait until they are as close as this sow.

who are fortunately situated as regards a local market may be able to quit them through the saleyards as heavy porkers, not of particularly good quality, at a time when there is a shortage of pork on this market.

Sows farrowing at this time of year require the usual management. They should be put into their farrowing quarters a week to ten days before they are due, to give them time to settle down. The farrowing houses should have been thoroughly cleaned out beforehand and any heat lamps used checked over. Heat lamps should be turned on before the sow farrows. It is far better to have them on for two or three days before farrowing than to have the sow farrow without the benefit of artificial heat, which will undoubtedly save piglets, particularly at this time of year.

A sow should not be fed for 24 hours before farrowing and only lightly fed for 24 hours afterward, but plenty of clean drinking water must be provided. If the sow is quiet enough to attend at farrowing, piglets that may otherwise be lost can be saved.

Feeding

After farrowing the sow's rations should be gradually increased during the next week or two until she is getting each day $4\frac{1}{2}$ food units for her own maintenance and 1 unit for each

pig in the litter. It is most desirable to include 2 to 3 lb of meal mixture a day in the ration, instead of relying solely on skim milk or whey. The piglets should be encouraged to feed in the creep as soon as possible, the object being to have creep feeding well established by the time the litter is three weeks old. The use of the special pellets obtainable for this

purpose is of great value. Boar piglets in the litter should be castrated when three weeks old.

Letting the sow and litter out into a clean paddock as soon as possible after farrowing is still by far the best preventive of piglet anaemia and its accompanying scours. A good alternative when the weather prevents the sow and litter being allowed out for three or four days after farrowing is to supply sulphate of iron. A handful can be thrown on the floor of the farrowing pen every other day.

Arranging Farrowing

By far the best method of getting sows to farrow at the right time of year, that is, two months before the dairy herd starts to calve and again six months later, is to mate maiden sows to farrow at the time required. However, sows that are not farrowing at the right time can be brought forward considerably by early weaning of litters at 14 to 18 days old and mating sows again three weeks after farrowing. But early weaning should not be practised unless proper accommodation for the weaned piglets is available.

This entails well insulated sleeping quarters, preferably of the kennel type with artificial heat available, and good, clean pasture on which the pigs can be let out for a run during the day whenever the weather is suitable. Full details of the best methods to use for the early weaning of pigs are given in Department of Agriculture Bulletin No. 389, "Early Weaning of Pigs".

During July and August the dairy farmer is very fully occupied with the calving herd, but it does not pay to neglect pigs. By proper organisation, work with them can be reduced to a minimum at this time of year.

Aldrin and Dieldrin Scheduled as "Noxious Substances" to Ensure Safe Handling of Concentrated Form

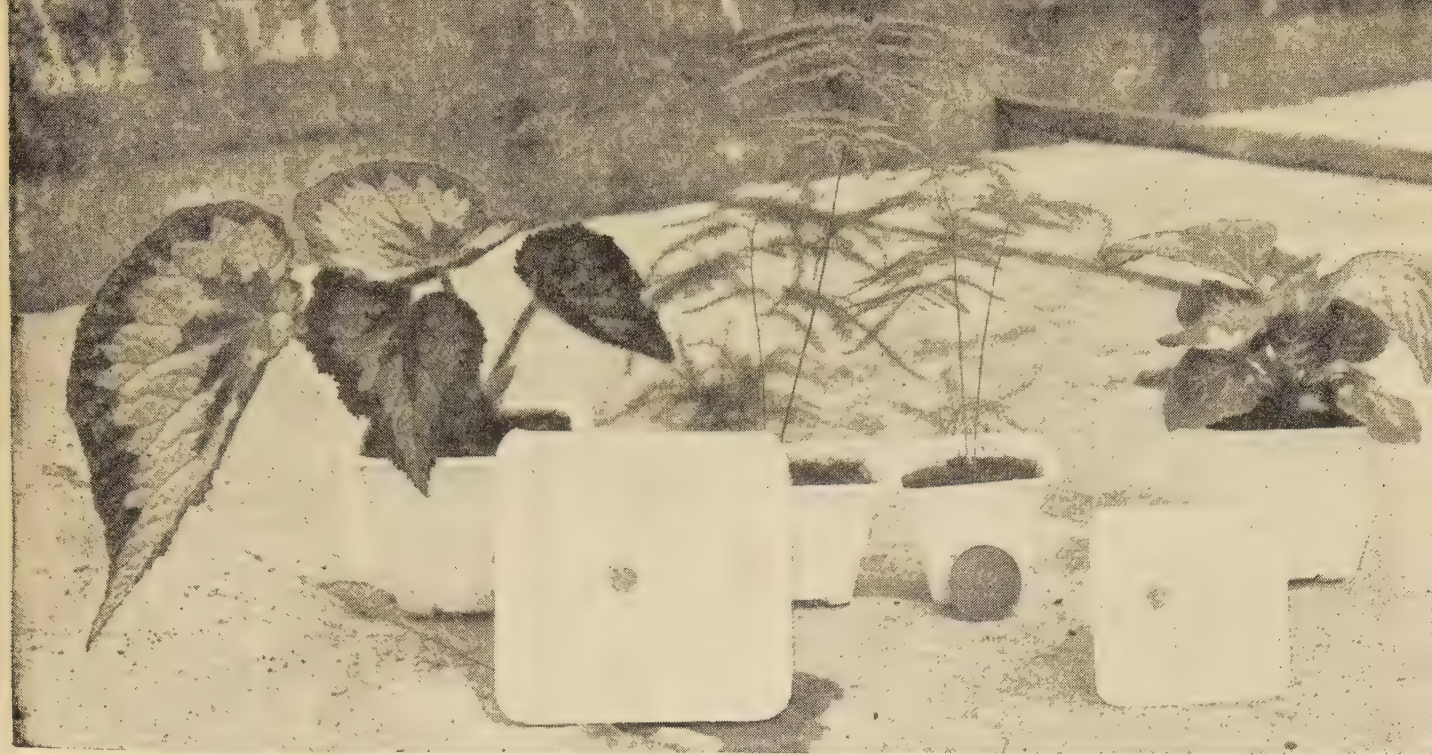
FARMERS may have been alarmed by recent radio and Press references to the well known chemicals aldrin and dieldrin as poisons. Such references were in error and were later corrected to the true statement that these materials have been scheduled as "noxious substances".

This action by the Department of Health in no way restricts their use for dipping and dusting sheep; it is merely a safety measure to ensure that workers handling them in concentrated form can be called on to observe certain commonsense precautions where there could be a health hazard. These precautions are legally enforceable under the appropriate conditions, and include the wearing of protective

clothing and washing after handling the materials.

There is no need for anyone to be alarmed. The old-type arsenical sheep dips, which are still available, are infinitely more poisonous; yet accidents from their use were relatively rare, because all farmers knew the potential dangers and treated the dips with respect.

Aldrin and dieldrin are in a totally different category; no one has died in New Zealand from swallowing them, but there is a danger of a slower form of poisoning by absorption through the skin. If given the opportunity, they can accumulate in the body and give rise to distressing symptoms.



Plastic Containers for Plants

By J. P. SALINGER,
Horticulturist, Department of Agriculture, Wellington

WITH the need for standardisation in production and the development of self service in retail sales the nursery trade is seeking new techniques in producing and selling plants. There is an increasing use of troughs and pots made from plastic, and in this article the use of these containers is discussed.

TRADITIONALLY New Zealand nurserymen have grown seedling plants in wooden seed trays containing 60 to 80 plants, which had to be removed and bundled by the retailer, and woody plants or pot plants in clay pots. Recently the development of suitable plastics and the testing of various designs have enabled the plastics industry to produce suitable pots to hold single pot plants and troughs to hold 10 or 12 plants at a

price competitive with that of older materials. Both seedling plants and pot plants in plastic containers can be displayed more attractively by the retailer for self service by the customer, and the plants, undisturbed by the retailer, are in better condition at time of planting. The adoption of plastic containers will need some slight alteration in the routine of production, but the nursery trade has in fact been modifying its methods over the years.

House plants in square plastic pots: Begonia rex (left), asparagus fern (centre), and coleus (right). The begonia and coleus are in 3 in. pots and the asparagus is in 2½ in. pots. The coin standing against one of the smaller pots is a penny. When the plants are being grown the pots can be kept as a group in a seed box.

Types of Containers

Nurserymen are now offered plastic troughs to hold 10 or 12 seedling plants, small plastic pots for individual seedlings, and larger pots for growing on or for selling mature plants.

The plastic must always be firm enough to stand handling when the container is full of wet soil; it must have adequate drainage holes which do not clog, and it must have a firm base so that it stands upright on the glasshouse bench or in the shop.

The pots and troughs of polyvinyl chloride/polyvinyl acetate plastic now being produced fulfil these requirements.

It is only natural that growers will be a little sceptical of the value of these new developments, and the advantages and disadvantages of these containers to both the grower and the gardener will be briefly discussed.

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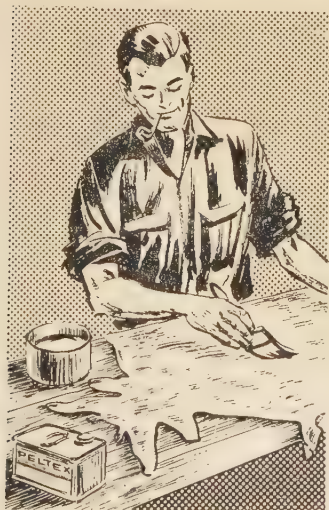
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the production and use can be standardised, as a known quantity of soil can be mixed and a specific area of glasshouse bench or frame space allocated.

Seed boxes vary in size and cannot always be placed to fill the available space. A wooden frame holding seven troughs each with 12 plants weighs only 17 lb filled with soil, while a seed box filled with damp soil weighs 37 lb. Less soil is therefore needed with the troughs and women can handle them easily. When plants are being pricked out they can be lined up more easily by eye and this is important where unskilled labour is used for pricking out.

Returnable seed boxes require collecting, cleaning, and repairing when received from the retailer, but the wooden holder only of troughs has to be returned.

Plants in troughs can be displayed for customers to choose their own plants; if the weather is unsuitable after purchase, the plants can be kept in the troughs until planting conditions are suitable. Experience has shown that plants transplant and establish quicker than loose plants cut out from seed boxes.

The disadvantages of troughs are their initial cost of 3½d. each and the fact that growers already have stocks of seed trays. If only one plant in a trough damps off, the value drops immediately. Generally the troughs are most suitable for quickly grown plants and not for plants held for a period. Early in the growing period unhealthy plants should be replaced.

The small, 2½ in. square plastic pots can be handled similarly to troughs in wooden holders and are suitable for tomatoes and cucumbers, etc., which are normally sold out of seed boxes. The individual plants should command double the price of box-grown plants.

Plastic Pots

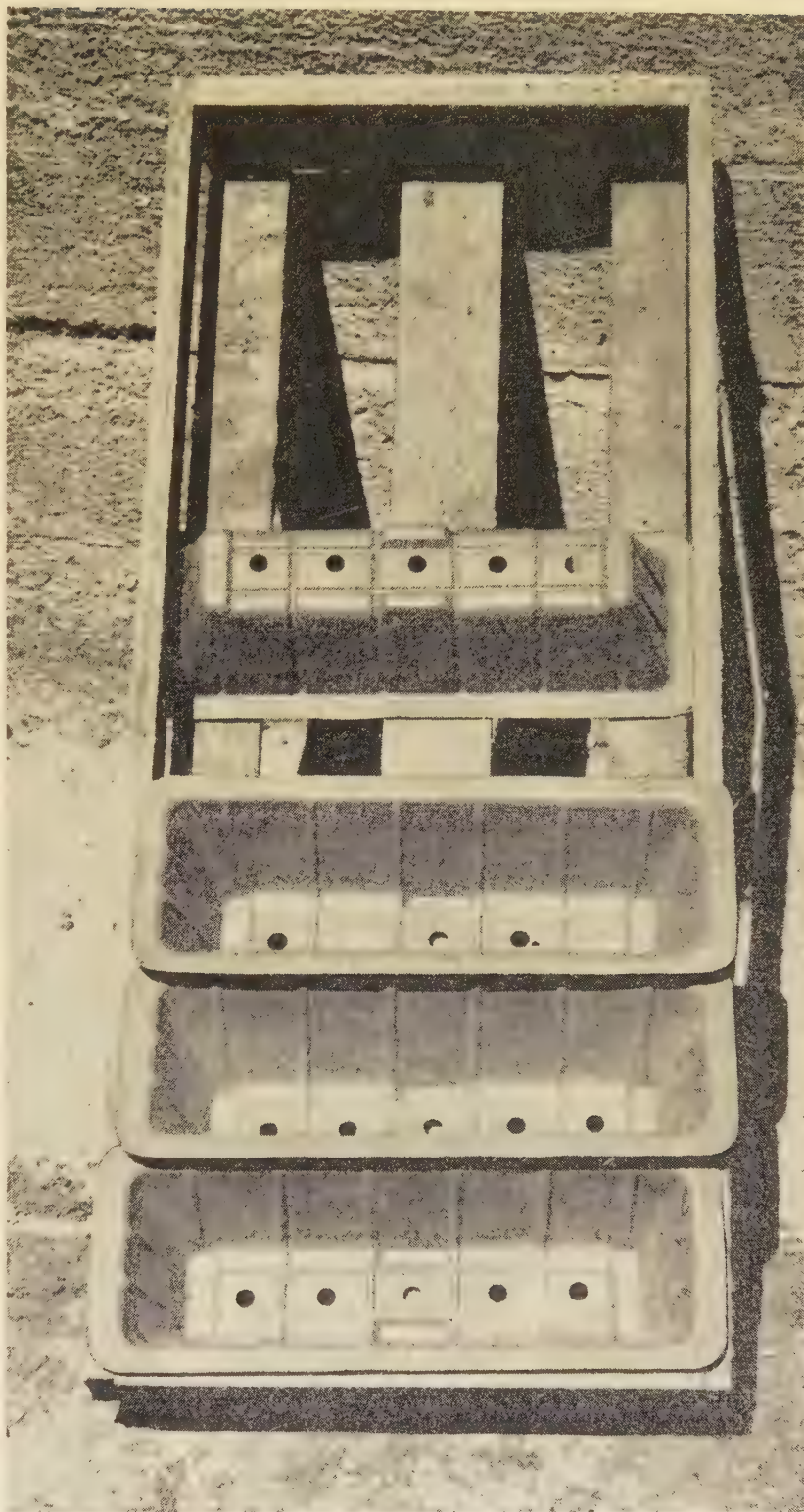
With the extension of the selling season for woody plants in pots and the demand for house plants being maintained, it is desirable that plants should be sold growing in attractive containers.

Clay pots are heavy, take up room when stacked, need cleaning before use and before sale, and frequently crack or break; plastic pots are just as suitable for growing the plants, are light, take up little room in storage, and are clean to handle and sell. Plants in plastic pots in shops are easier to look after, as they do not dry out as quickly as in clay pots. They eliminate the need for repotting shrubs into paper pots before dispatch.

Approximate comparative prices of clay pots and plastic pots (ex factory) are:

		Clay pots per 1,000		Plastic pots per 1,000	
		£	s.	Square	Round
3 in.	..	13	8 11	10 13	10 13
4 in.	..	16	12 10	14 10	14 10
5 in.	..	21	16 15	16 15	16 15

PLASTIC CONTAINERS FOR PLANTS



Plastic seedling troughs in a wooden holder. The top trough is inverted. These troughs have adequate holes and raised areas on the bases to ensure drainage.

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- '100' 100,000 units penicillin per tube.
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PLASTIC CONTAINERS FOR PLANTS



Seven troughs each holding 12 plants ready for delivery to the retailer.

The shallow pots used for house plants are of similar design to those used in the United States of America and provide a broad, solid base, and proportionately more of the plant is seen.

Square plastic pots are suitable for the direct sale of plants to customers, but are not as convenient for packing; the round pots are more suitable for dispatch, but it may be necessary to

cover the exposed soil surface with paper before packing. Young hedging plants and forest trees which previously have been sold in seed trays will transplant better when supplied in small plastic pots.

Change in Growing Methods

As these plastics are impervious to air and water, nurserymen will need

to modify their growing methods slightly to produce first-class plants.

When trees and shrubs are grown in clay pots it is almost essential to plunge these pots to reduce watering. Plastic pots need not necessarily be plunged, and if not plunged, groups of plants of the same variety can be bulked together as sales are made. In both cases overhead irrigation can be used, but plants in plastic pots will require less water than those in clay pots.

When plants are grown in these containers the soil mixture should be sterilised and of an open, porous nature; it need not be rich in plant nutrients, as these can be applied, preferably in solution, as required by the plants. This aspect should not be neglected, as feeding will probably be needed, as will watering, before the plants show an obvious need.

Advantages of Plastic Containers

Plastic containers for plants are definitely becoming more popular. They are easier and cleaner to handle than traditional containers, which are returnable and need cleaning and large storage areas. Provided the prices of the new containers do not greatly exceed the cost of wooden boxes or clay pots, they should have a definite place in nursery production, as they reduce handling and allow standardisation and mechanisation. They also enable plants to be sold in containers which are themselves decorative and useful. Though not replacing pots or boxes, they are in keeping with modern trends of rationalisation of production and attractive presentation to the consumer.



After the troughs are placed in the holder and filled with soil the holders are treated as a complete unit. Here primula seedlings are being pricked out from the seed box (foreground).

TARTAN

Topics

Control of Variegated, Scotch, Nodding and Winged Thistles

Products Recommended:

If no clover damage is acceptable: TARTAN M.C.P.B.
 If slight clover damage is acceptable: TARTAN M.C.P.A.
 On mature thistles or if clover damage is acceptable: TARTAN 2,4-D ESTERS

Dosage Rates:

M.C.P.B. 3-4 pints (1-1½ lbs. acid equivalent) per acre.

M.C.P.A. 1½ pints (¾ lb. a.e.) per acre at small rosette stage.
 2 pints (1 lb. a.e.) per acre at full rosette stage.

2,4-D 2 pints (1 lb. a.e.) per acre for Variegated and Scotch Thistles.
 ESTER Mature plants.
 3 pints (1½ lb. a.e.) per acre for Nodding and Winged Thistles.
 4 pints (2 lb. a.e.) per acre for Saffron Thistle.
 1½ pints (¾ lb. a.e.) per acre for all Varieties at the small rosette stage.

Time of Application:

Preferably small rosette stage, especially for Nodding and Winged Thistles.

GENERAL DIRECTIONS

The Thistles listed are more easily killed when young and flat rather than when older and in stalk. For best control and least clover damage spraying at the small rosette stage is essential. For large mature plants, 2,4-D esters, which are seriously damaging to clover, must be used.

Aerial Application:

Spray in July or early August with 1½ pints (¾ lb. a.e.) of 2,4-D ester mixed with 3-5 gallons of diesel oil per acre. As separation may occur on standing, mix 2,4-D and oil just before use. Alternatively, 2,4-D, M.C.P.A. or M.C.P.B. may be applied with water at the ground rates recommended in this bulletin.

CAUTION

Variegated Thistles are poisonous and become dangerous at the palatable wilting stage. Keep stock off for about 10 days.

There's nothing finer!

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Log of David Brown 900D, by Mr. A. Howden, Lochiel. Kept on hour meter. Max. engine R.P.M. 1850. Oil consumption: No oil added between changes (120 hours).

CLASS OF WORK	HOURS WORKED	GALLONS USED	GALLONS PER HR.
Odd jobs, winter feeding, lambing, discing.	148	76	·51
Cultivations, odd jobs, mainly heavy work ploughing (Hyd. swamp. 2 15 x 8 furrows—3rd gear). (Hyd. Standard, 3 12 x 6 furrows—3rd gear). (Discing, 7' tandems, trailing 3 leaf harrows and 9' roller—3rd gear, 7' tandems—4th gear).	173	114	·66
Discing—4th gear, 9' roller trailing 3 harrows—4th gear.	34	19½	·57
11 tyne cultivator, 6" deep on worked ground—4th gear.	7	4½	·64
Rolling, trailing 3 harrows on soft ground—5th gear.	7	6	·86
Rolling, trailing 3 harrows—4th gear.	7½	4½	·60
Total hrs. worked and fuel used since purchase 16/2/58.	518	310	·60

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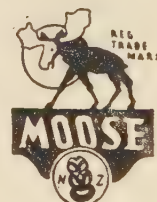
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Steam Plant for Rendering Old Bee Combs

By C. G. ROPE,
Apiary Instructor,
Department of Agriculture,
Auckland

THE pressing of melted and water-saturated old combs in hessian or scrim bags under boiling soft water to secure the maximum quantity of recoverable beeswax is common among beekeepers. Though efficient, this is an arduous, dirty, and lengthy process and there is risk of scalding to the operator and considerable danger of fire to the premises when it is done indoors. This article describes an alternative method, using steam, which is equally efficient and far less laborious.

IN the warmer areas of New Zealand large numbers of old bee combs, from which the beeswax could be salvaged either for sale or for conversion into comb foundation, are lost annually through the ravages of the wax moth. The beekeeper who provides himself with an efficient comb-rendering plant has at his disposal an economical means of helping to maintain good worker combs in his hives, one of the basic essentials of successful honey production.

In Northland and other districts a method using low-pressure steam has been devised for recovering beeswax from old combs. This method overcomes most of the disadvantages of the press while being equally efficient. Chemical analysis of the "slum gum" residues left after the completion of a steam melting such as is described in this article showed a beeswax content of 1.072 per cent. With good equipment a minimum of 400 combs per day can easily be treated by a single operator, who has at least three hours of free time during the operation for alternative occupation.

Results indicate that it would be economically advantageous for any beekeeper employing labour to buy a small low-pressure boiler for this purpose alone. With the widespread reticulation of electricity to rural districts suitable boilers of the type formerly used by dairy farmers for heating water in the shed are often available at a much reduced price.



A honey tank for use as a wax melter with the wire-mesh strainer in position.

Domestic and sideline beekeepers should find little difficulty in devising for their own use small-scale melters on the lines described here.

Plant

A tank made from galvanised iron, tinned steel, or copper is required to hold the old combs for rendering. Disused honey or extractor tanks are excellent for this. The tank, particularly when used in the open, should be insulated on the outside to prevent excessive heat loss. Soft board or several thicknesses of sacking or felt tied around the outside will do. A $\frac{3}{4}$ in. galvanised pipe 2 in. long, or alternatively a honey gate, is fitted to the bottom of the tank for drainage. If the beekeeper wishes to construct

his own tank, a rectangular one 6 ft long, 3 ft deep, and 22 in. wide will be found very suitable and will hold over 100 combs per melting.

Irrespective of the type of tank used, a strong top rim and a good-fitting, non-warping lid are essential. The lid should be lined with a resilient material which will give a good seal when held down with weights or clamps. Tinned steel containers are preferable for handling liquid beeswax, as galvanised iron has a slight tendency to darken the wax. Liquid beeswax should never be allowed to come in contact with uncoated steel or black iron containers, as the resultant discolouration will depreciate the commercial value of the product.

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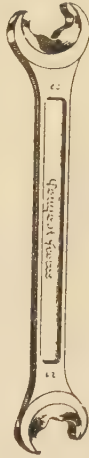
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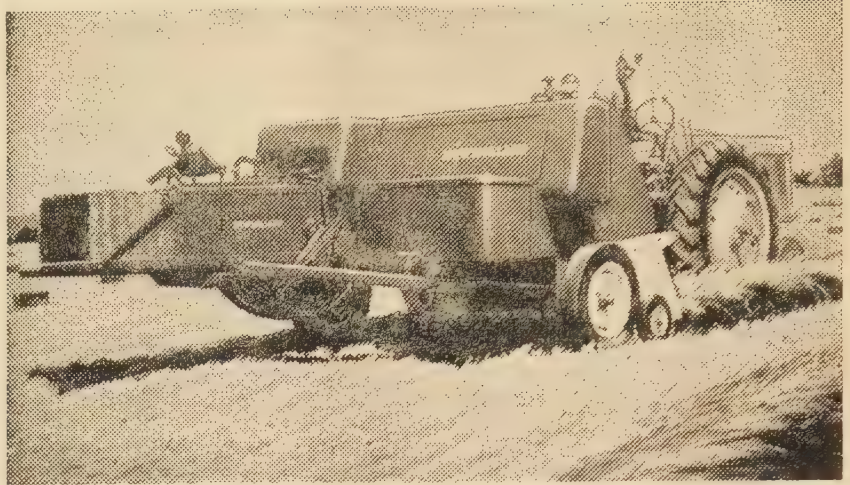
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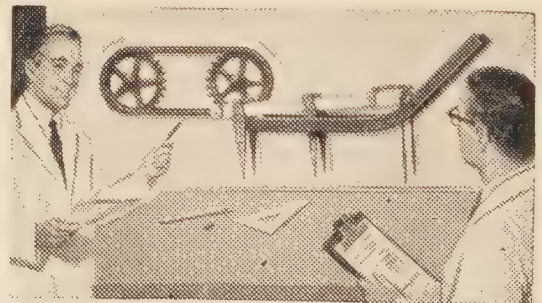
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BULLETINS

A comprehensive display of Departmental bulletins may be seen at your local office. When in town, call and inspect them. You may see a bulletin that will solve that farming problem.

A $\frac{3}{8}$ in. mesh wire-netting screen mounted on a 1 in. galvanised angle-iron frame is placed loosely inside the tank and is supported on 4 or 5 in. legs to keep it clear of the bottom and to provide a reservoir for the wax beneath it. The steam inlet, a strongly riveted flange threaded to take a $\frac{1}{2}$ in. water pipe, is placed on the side at the top of the tank. The tank should have a slight fall to the opening and be supported on a strong wooden structure high enough to enable a bucket to be placed beneath the outlet.

Method of Operation

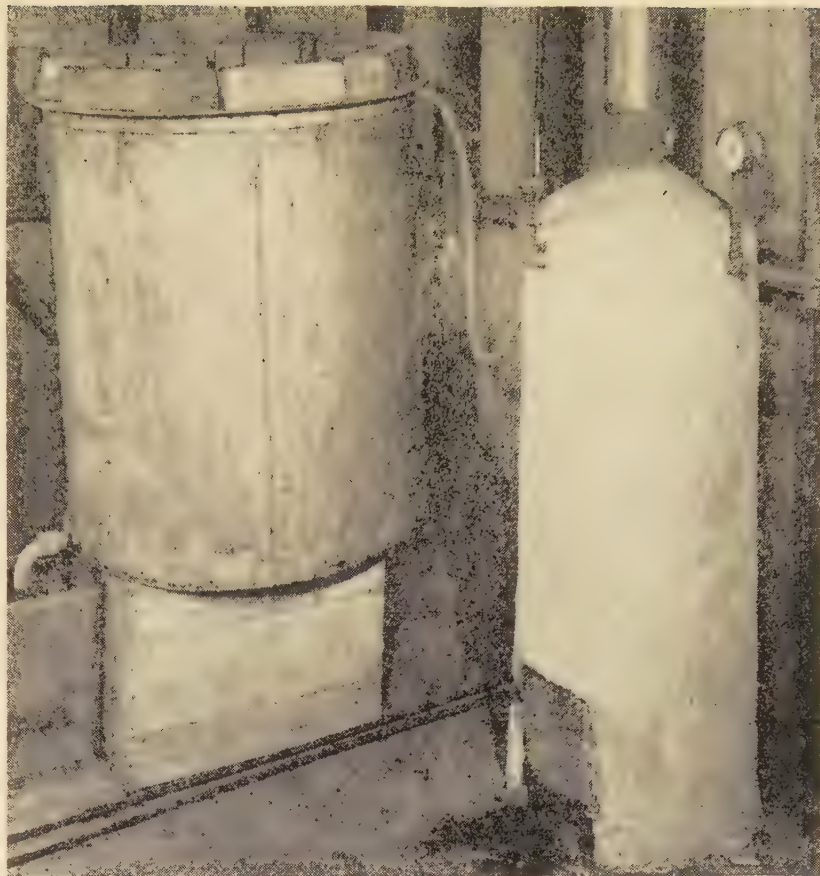
A No. 4 mesh 20-gauge galvanised wire screen similar to that used in the manufacture of honey extractor baskets, or a scrim cloth which will act as a coarse strainer, is laid out on the wire-netting screen to retain slum gum and prevent it from recontaminating the salvaged wax. With care scrim may be reused two or three times.

If a rectangular tank is being used, it can be filled with several layers of old combs still in their frames, standing vertically and packed tightly together so that the wooden frames with their wires will prevent the cocoons from falling down during the melt and will thus allow easy drainage of the liquid wax.

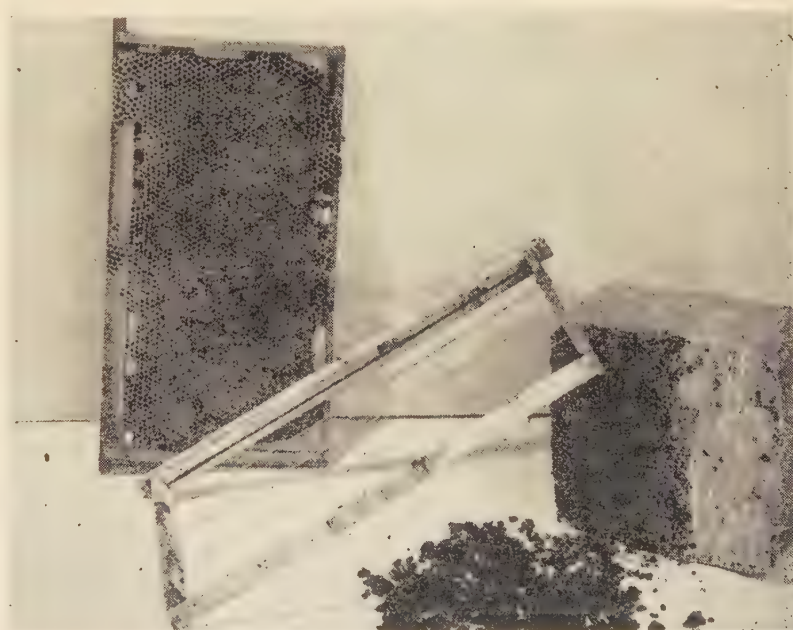
When a cylindrical tank is used a criss-crossed stack of horizontally placed combs is built up on top of the screen. The balance of the space is filled with combs to best advantage. Criss-crossing the combs in this way enables the wires of the frames to function as an additional screen and assists drainage of the wax.

It is essential, if the melter is to function satisfactorily, that the steam be introduced at the top of the tank and that it should have an unobstructed passage over the top of the frames. Introduction of the steam to the bottom of the tank will cause blockage of the melter and emulsification of the wax. The steam lead to the melter must be securely attached to safeguard the operator against risk of scalding. Because of the sustained heat within the melter it is necessary for the operator to wear suitable gloves when removing the frames and slum gum.

The melter should not be run under pressure, as the passage of steam from the top of the tank down through the combs and out via the bottom outlet produces the desired result. After the



A complete plant with a furnace-type boiler, melter tank, and wax receptacle. The steam inlet is at the top of the tank.



Old black comb due for rendering; a frame after treatment; loose, crumbly slum gum; and a sample block of wax with firm texture and no emulsification.

RENDERING OLD BEE COMBS . . .

lid is weighted or clamped into position wet steam is turned on and a trial run is made for two hours.

As there is no pressure in the tank, emulsification of the wax does not occur during this process, as steam is merely passing over the liquid wax and is not forced into it.

Emptying the Melter

After the steam is turned off the lid is removed, care being taken to avoid the resultant outrush of superheated air. A sample of slum gum can then be squeezed between gloved hands. If no traces of wax appear in the compressed slum gum, it can be assumed that the melting has been completed. If lines of wax become visible, it will be necessary to continue melting until the operating time of the particular melter can be assessed. A 2-horsepower boiler will usually melt 100 combs in two to three hours, a smaller one taking longer.

If the hot wooden frames are given a light tap on the inside of the tank as they are removed, any rubbish will be dislodged and the frames will be ready for renailing and rewiring. Should the woodwork of the frames be very much discoloured, it can be improved by dipping them in a weak solution of caustic soda and hot water after they are taken from the melter.

The slum gum can be shovelled out into a wheelbarrow for disposal or, as it still contains a small percentage of wax, quantities of resins, and other

combustible material, it may be used for fuel if the boiler is other than oil fed.

When the tank is fitted with a honey gate the provision of an exhaust outlet 3 in. above it, but below the screen, will assist the melter to function correctly by allowing steam to circulate freely while the gate is closed, and at the same time enable the hot liquid wax to accumulate in the bottom of the tank where it is protected from becoming contaminated by robber bees. This reservoir can be emptied whenever convenient during melting.

To provide for the settlement of any sediment and good final moulding, 2 in. of boiling water should be placed in the containers before the wax is run in. Where a pipe outlet with no honey gate is used, as in the upper illustration on page 45, wax moulds will need to be changed as they become filled.

In cold weather, or when the melter is in the open, it may be difficult to keep the wax hot enough as it leaves the melter to obtain good clarification of the block. This may be overcome by fitting a pipe bend to the outlet, as shown in the upper illustration on page 45. This has the effect of directing the exhaust straight down into the wax receptacle and a suitable temperature of the contents is maintained.

To assist clarification, and to produce a better block free from cracks, the wax should be kept liquid

in the moulds for as long as possible. This can be accomplished when four gallon tins are used for moulds, by placing two tins of hot wax together in a wooden case and covering the lot with sacks or other insulation. Twenty-four hours later the blocks will be set and they will usually fall easily from the tins. The best results will not be obtained unless these precautions are taken. When the blocks are difficult to remove from the moulds, warming the outside of the mould with a blow lamp will cause them to drop out easily. The provision of moulds with bevelled sides will overcome this difficulty. The use of moulds of uniform size will facilitate packing of the blocks for shipment.

With this method of reclamation the wax is gently separated without boiling or pressing and consequently it does not absorb to the same extent the dark stains derived from resins, pollens, and other impurities in the comb.

Correctly used, this melter will produce a good, firm wax free from emulsification and of the best possible colour. It needs no further preparation for market other than the removal of sediment from the bottom of the block.

All photographs by Sparrow.

New Bulletin on Shearing and Wool Handling

A BASIC requirement for wool growers who expect to receive the maximum return for their product is that they should know the fundamentals needed to prepare a clip and should be able to instruct shed hands on how the various lots of wool should be prepared.

To aid farmers in this the Department of Agriculture has recently issued Bulletin No. 395, "Handling Crossbred Wool at Shearing".

Though concise, the bulletin adequately deals with all aspects of shearing and wool handling and emphasises that a common misconception of farmers that shed work is not important is responsible for considerable loss of revenue.

The bulletin discusses woolshed design, cleanliness of sheep and woolsheds, proper shearing techniques, and handling of the fleece from shearing through all processes to baling.

Illustrations aid the descriptions of correct and faulty handling of the fleece.

The bulletin is available for 1s. a copy at all main offices of the Department of Agriculture.

Meteorological Records for May

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches							Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		Date		
				Maximum	Minimum				Amount	Date			
Kerikeri	240	52.5	— 3.8	69.7	37.5	5.01	23	— 2.18	1.23	22	159		
Auckland	160	53.8	— 2.8	68.3	41.9	4.99	24	+ 0.20	0.78	5	151		
Tauranga	12	50.6	- 3.0	66.1	32.1	2.54	15	+ 2.59	0.70	26	150		
Reakura	131	48.6	- 2.8	64.3	29.9	5.05	20	+ 0.55	0.63	26	133		
Whakarewarewa	1,006	47.2	- 2.0	64.8	32.3	4.01	17	— 1.49	1.03	22	133		
Gisborne	14	51.4	- 1.5	69.0	31.4	6.53	17	+ 1.76	0.97	18	133		
New Plymouth ..	160	50.6	- 3.1	64.8	34.7	7.61	23	+ 1.54	1.03	10	125		
Karioti	2,125	41.8	- 3.7	58.9	28.0	10.99	24	+ 6.97	1.38	28			
Napier	5	51.0	- 1.8	72.9	33.4	6.24	17	+ 2.90	2.03	19	135		
Wanganui	72	49.6	- 3.4	65.4	33.0	7.09	24	+ 3.97	0.98	5	69		
Palmerston North	110	47.7	- 3.3	63.0	31.6	6.16	26	+ 2.84	0.95	10	62		
Waingawa	340	46.7	- 2.8	66.0	26.2	9.07	24	+ 5.02	1.36	14	80		
Wellington	415	48.2	- 3.1	65.3	34.8	10.12	20	+ 5.56	1.57	7	103		
Nelson airfield ..	5	44.7	- 3.8	61.1	27.2	3.89	10	+ 0.85	1.64	22	153		
Blenheim	12	46.4	- 3.2	67.1	26.0	2.44	12	— 0.99	0.98	14	189		
Hokitika	15	45.0	- 3.2	62.0	28.1	5.78	14	- 3.50	0.76	27	126		
Hanmer	1,270	39.1	- 5.7	65.2	21.7	16.68	21	+ 12.20	3.05	18	76		
Christchurch ..	22	43.6	- 4.0	63.8	25.1	8.61	19	+ 5.76	2.97	6	111		
Ashburton	323	42.6	- 4.1	63.2	24.0	9.76	17	+ 7.21	2.00	6	110		
Timaru	56	43.4	- 3.4	62.3	26.8	3.97	11	+ 2.44	1.50	6	105		
Alexandra	520	39.4	- 3.5	60.9	23.4	1.15	13	— 0.24	0.20	2	115		
Talari	80	41.8	- 4.1	66.0	27.8	4.52	23	+ 2.43	1.33	5	84		
Invercargill airfield	0	41.3	- 4.0	58.2	25.3	6.83	25	+ 3.09	0.95	24	87		
Chatham Islands	150	50.4	- 0.2	59.3	36.9	9.04	29	+ 5.59	1.90	15			

THE SOIL ADVISORY TEST FOR POTASSIUM

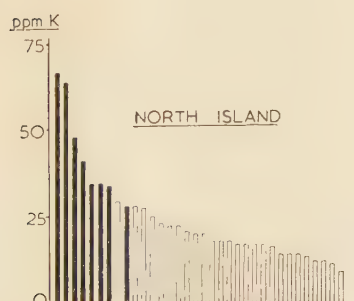
THE present soil test for potassium (Morgan's test) is the fourth used by the New Zealand Department of Agriculture since its inception. In 1899 B. C. Aston, Chief Chemist of the Department, carried out analyses using citric acid to extract the soil potassium. In 1937 E. B. Davies introduced a 2½ per cent acetic acid extractant, a test still used at the Macaulay Institute for Soil Research, Aberdeen. Field advisory officers were, however, sceptical of the value of soil testing generally, and very few analyses were carried out for advisory purposes.

WITH the establishment of the Rukuhia Soil Research Station, facilities were improved for investigating overseas tests. From a series of pot trials the Purdue potassium test (developed at Purdue University, Indiana) was selected and further compared against indications from topdressing trials. This test was used in the laboratory for a number of years. However, the introduction of the flame photometer, with its greatly improved method of measuring the extracted potassium, made a change desirable, and in 1953 Morgan's test, employing a similar type of extractant, but one more suited to atomisation in the flame, was adopted and is still in use.

Morgan's test for potassium was favourably regarded on the whole by North Island extension officers, who found good agreement between laboratory and field data, but a number of South Island officers criticised the test on the ground that many soils giving low potassium values showed no response in the field.

EXPERIMENTAL In view of this situation it was decided to secure soil samples from reliable observational trials and examine them by a number of different techniques. Samples (0 to 3 in.), taken precisely with a tubular sampler by extension officers, were obtained from control plots and sent to the laboratory for analysis. Various tests recommended by overseas workers were investigated. These included extracting the potassium with Morgan's reagent, ammonium acetate, and boiling nitric acid, igniting the soil and measuring the potassium released by the ignition, and incubating samples with a prepared resin which absorbed the soil potassium.

RESULTS It is not possible in this research note to present all the data gathered, but the best "quick test" method for predicting potassium responses was given by a short ammonium acetate extraction.



EXPLANATION OF GRAPHS

The amount of potassium extracted by the ammonium acetate test is shown graphically below. Each column represents a soil, the height of column indicating the amount of potassium extracted. Black columns represent soils where pasture does not respond to potash dressings (non-responsive soils) and white columns where it does (responsive soils). In this type of graph a good potassium test would show a block of black columns on the left, a block of white on the right, with possibly a few indeterminate soils in between.

NORTH ISLAND TRIALS

The test readily distinguishes between the potassium responsive and non-responsive soils. The non-responsive soils (with the exception of one) release greater amounts of potassium and fall on the left-hand side of the graph. The responsive soils release smaller amounts and fall on the right. These results show that the rapid ammonium acetate extraction is a very satisfactory test on North Island soils.

SOUTH ISLAND TRIALS

The graph shows that the differentiation into responsive and non-responsive groups is not nearly as good as that found for the North Island. There are four non-responsive soils (black columns) falling on the right-hand side of the graph. This means that these four soils are giving low potassium tests, but show no response in the field. An examination of these trials revealed that the anomalies were all alluvial soils from Canterbury. The peculiar behaviour of these soils is probably connected with the type of clay mineral.

If soils from the Canterbury trials are omitted from the South Island series, we get the graph shown on the right, the soils falling correctly into place. Thus, it is clear that the rapid ammonium acetate test works very well in the South Island, except on certain Canterbury soils. Fortunately, potassium responses are almost non-existent in Canterbury, so that the lack of a suitable soil test for the Canterbury soils is not, at the moment, a pressing practical problem. The response level (level at which potassium responses are unlikely to occur) is lower in the South Island than in the North.

Morgan's Reagent is still being used in the soil potassium test. This test gives a fairly good differentiation into responsive and non-responsive groups (again leaving out the Canterbury trials), but on the whole is not as good as the ammonium acetate extraction.

The necessity for new equipment has delayed the introduction of the new test, but as soon as this is available, a change-over to the ammonium acetate extraction will be made.

—D. E. HOGG

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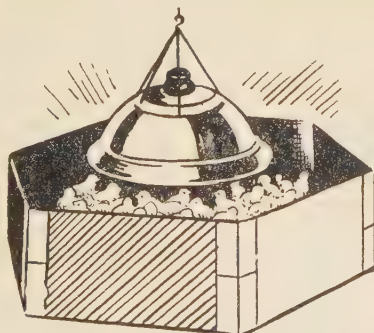
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The Home Garden in August

By A. G. KENNELLY,
Horticultural Instructor,
Department of Agriculture,
Dunedin

CONTINUITY of supply is very important in the home garden, and to ensure that supplies are available after winter crops are finished many home gardeners sow a wide range of vegetables early in August. If seed and cultural conditions are good, success usually depends on favourable climatic conditions.

SMALL sowings of the following vegetables can be made in well drained soil in favourable situations: cabbages, cauliflowers, Chinese cabbages, carrots, kohlrabi, leeks, onions for salads, lettuces, peas, parsley, radishes, salsify, scorzonera, silver and perpetual spinach beet, spinach, and turnips.

Plants which can be set out in well drained, fertile soil are artichokes (Jerusalem, tubers), cabbages, cauliflowers, Chinese cabbages, chives, garlic, kohlrabi, lettuces, potatoes (in early areas only), rhubarb, shallots, onions (in districts where spring planting is favoured), and silver and perpetual spinach beet.

Ground conditions, particularly where soil is heavy or moderately heavy, are rarely consistently good throughout New Zealand in August and if there is a cold, wet spell after sowing, crops may fail. Sowing and planting should therefore be confined to the hardiest vegetables and made only in well drained soils in favourably situated gardens where the ground has warmed enough.

If there is a doubt about the suitability of the soil for working up and for sowing, walking on it will indicate if it is too wet. Usually it is not too wet, if it does not stick to the soles of the boots. If there is enough moisture, soil condition is less important for planting than for sowing. If the soil is inclined to be wet for sowing or planting, it is better to work from a board laid on the ground than to walk on the surface.

The importance of continuity of supply of vegetables cannot be overstressed, and because in most gardens a break in supply is most likely early in the season, when winter vegetables are exhausted and before the new season's supplies are ready, it is



Cloches and wire-netting bird guards are useful accessories early in the season.

usually desirable that seed sowing or the setting out of young plants should be started in the new season as soon as possible. However, August sowings of any particular vegetable should not be extensive, because though conditions are usually sunnier than in June or July, soil temperatures are still comparatively low and frosts may be heavy, and results may be disappointing.

Under Glass

In a few districts frost-tender plants such as tomatoes, cucumbers, marrows, pumpkins, and melons can be sown under glass to be ready for setting out when frost danger is past. Though the time taken to produce good plants for setting out varies according to temperature and cultural conditions, tomatoes started in warm, favourable conditions usually take about six to seven weeks and the other plants mentioned about three to five weeks to reach a suitable state for planting out.

Sowing should be governed by the facilities available and the extent of damaging frost. Frost-tender plants should not be ready too early. Such plants are usually set out from about mid October to late October in some northern districts or to the second week in November in southern districts subject to late frosts.

Asparagus

The consumption of asparagus is increasing in New Zealand, and as the plant is easy to grow and the shoots are tasty and of good food value, it deserves to be grown more widely in gardens with enough space. However, the plant does not yield heavily in comparison with other vegetables.

An asparagus bed in suitable soil and properly established and cared for should last 20 years or more. In favourable situations where the soil is dry enough a new bed may be planted toward the end of July, but August is usually the preferred month for planting in the North Island; later planting may be advisable in some southern districts, where growth begins later and soil conditions may be unfavourable in July and August.

For home gardens plants are usually bought from seedsmen or nurseries. One-year seedlings are usually chosen, as they transplant better and establish more readily than 2-year-old plants, which are considerably larger and therefore more subject to damage through transplanting.

A new bed should be deeply dug. For best results on most home garden soils the bed should be well manured with such material as well rotted stackbottom, stable or farmyard



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manure, or compost. Perennial weeds should be destroyed and, if necessary, the area should be drained by breaking the subsoil or, where drainage is very poor, by installation of field drains. Built-up or raised beds are an advantage where the surface soil is shallow or drainage is poor, though in some soils, owing to expansion of the crowns and erosion of the soil, crowns tend to be too near the surface after a few years and beds may have to be built up to keep the crowns covered.

In August or September the young plants may be set out in permanent positions. Male plants give a larger yield than female plants, but it is not practicable to sort the sexes and discard the female plants.

Only by selection of the best plants of both sexes and continuation of seeding in isolation can the general standard of a so-called "variety" of asparagus be improved and, equally important, maintained. Because of the labour and area required this work cannot be done by the average home gardener. In the absence of such work, however, growing asparagus from seed is bound to result in many poor plants.

Every effort should be made to secure plants whose "pedigree" is known.

Depth of planting depends on soil type, but crowns are usually set about 8 in. below soil level in loose, friable soil with the roots spread thinly in fertile soil in the bottom of a trench.

The top bud should not at first be covered by more than about 2 in. of soil, as the young plants are liable to be retarded if deeply covered before they become established and sufficiently strengthened. The crowns should be planted 18 in. apart in single or double rows; single rows are generally preferred.

Beds, which should not be less than about 42 in. wide, may be intercropped between the rows during the first two years after establishment; if small plants that do not interfere with the growth of the asparagus are grown, intercropping may be continued longer. Good growth of asparagus can be expected in well drained, free-working loams. The popular belief that salt is essential is not borne out by commercial experience, though the plant is known to tolerate it.

Fertiliser Needs of Asparagus

Fertiliser needs vary according to the condition of the soil, but a fertiliser that has given good results over a wide range of conditions consists of 4 parts by weight of blood and bone, 1 part of sulphate of ammonia, 3 parts of superphosphate, and 1 part of sulphate of potash. It can be applied at from 2 to 4 oz per square yard, and if it is used on established beds, it is better applied in early spring or after

the last cutting. Alternatively blood and bone at 3 to 6 oz per square yard or farmyard or similar manure will usually encourage good growth.

Lime should be applied in moderation, though on most soils a little lime each year, about 1 to 2 oz per square yard, may correct acidity and assist in the availability of plant food.

Weed control should be rigorous, and on large beds one of several proprietary brands of selective weed-killers which have given promising results on some commercial asparagus can be used.

The period during which asparagus can be cut varies greatly according to the bed and may range from about six to about 10 weeks. Young beds may be harmed by too early cutting. In the third year from seed sowing (the second year after setting out), only if the growing season is long and plants are well grown, can cutting be carried out for more than two weeks; in the fourth year the cutting period should not exceed about half the season or about four weeks. Thereafter cutting can continue each year for from six to about 10 weeks according to season and growth and vigour of the bed.

The "varieties" or "strains" commonly grown in New Zealand include Mary Washington, Mary Washington No. 500, Paradise, Conners Colossal, and K.B.F.

Onions

In most North Island districts and in some northern districts of the South Island main crop onions are grown from seedlings raised in autumn and planted out in early spring. In most central and southern South Island districts autumn-sown plants are allowed to mature where they were sown and usually are harvested in November or December as "thick necks" without being encouraged to form large bulbs.

Ground where onion plants are to be set out should be highly fertile and well drained. On most well cropped soils a complete fertiliser with organic matter such as rotted compost or animal manure should be satisfactory, as the onion is a gross feeder and the bed is unlikely to be over-fertilised. Better results will be obtained if the fertiliser is incorporated throughout the root area rather than in the immediate area of root development.

As the onion is sensitive to excessive soil acidity, lime may be necessary. An annual dressing of about 2 to 4 oz per square yard should give satisfactory results in most districts. The quantity should be reduced in districts with low rainfall.

Ground for onion plants should have been thoroughly cultivated some time

in advance. Ground on which onions have previously been grown is satisfactory if previous crops have been free from serious diseases. Plants can be set out 3 to 6 in. apart in rows 12 to 15 in. apart.

Varieties include early maturing, giant, and long-keeping types, and some of each kind should be grown. Plants are usually available from seedsmen in districts where it is usual to set them out at this time of year.

The variety most generally grown commercially is Pukekohe Long-keeper. Numerous other varieties are listed by seedsmen, some of the names being synonyms. Where size is wanted Giant Rocca, Ailsa Craig, and Prize-taker Improved are worth a trial.

Peas

In poorly drained soils or areas not lying favourably to the sun sowing of peas is best delayed for at least another month. Elsewhere a dwarf early variety can be sown, and if space permits, successional sowings can be made every two or three weeks.

A dwarf variety is usually preferable for the first sowing, but tall varieties, which mature later, may be used. Alternatively two or three varieties with successional maturity dates can be sown at about the same time.

For early sowings seeds should be dressed with a suitable seed protectant, as diseases are especially troublesome early in the season, when the ground is cold and often wet. Some of the best varieties include William Massey and Little Marvel (dwarfs) and Victory Freezer and Greenfeast (intermediate varieties).

Rhubarb

Though most home gardeners prefer to establish new rhubarb beds with crowns brought in from outside sources or obtained by the division of home-grown crowns, rhubarb can easily be grown from seed sown in August, September, or October. Seed should be sown 1 in. deep in rows 15 in. apart in fertile, well drained soil. Seedlings should be thinned to about 6 in. apart as soon as they are properly established. Young plants can be set out in their permanent positions early in the following spring.

Usually few if any stalks should be pulled from rhubarb until after the second year of establishment from seed, though the home gardener should be guided by the condition of his plants. A moderate amount of earlier pulling may not harm the plants if they are large, well established, and vigorous and the soil is moist and fertile.

Generally it is rarely possible to recommend seed of a particular

HOME GARDEN . . .

variety of rhubarb, as usually plants raised from seed are extremely variable in their characteristics and in the quality and flavour of their stalks.

In most districts main-crop rhubarb should now be showing signs of growth. The buds on the rootstock or crown first enlarge and then the new growth bursts forth. If a new bed is to be planted or the crowns in an old one are to be broken up, no time should be lost.

Rhubarb is a hardy plant that will stand a great deal of ill usage, but for best results the crowns should be planted before growth has developed beyond the stage where the buds can be clearly distinguished but have not burst. It is advisable to await this stage so that the splitting of the crowns, usually best done with a sharp spade, can be done efficiently. Only one or two buds should be left on each section of the crown to be planted.

Replanting

Replanting should usually be done about every four years, but variety, soil, and situation all play their part and in some instances beds will continue to produce good stalks for up to 10 years. If, however, the stalks become thin, weak, and very numerous, usually the crown has become hollow in the centre; it should be dug up as soon as it is dormant, split, and replanted.

When crowns are replanted the tops should be covered to a depth of about

1 in. The soil should be rich in organic matter such as stable or farm-yard manure, compost, or rotted stack bottom. Where strong crowns have been planted in well drained soil over-manuring is unlikely in most home gardens, as rhubarb is a rank-growing plant and responds to a rich soil. If natural organic manure is not available, a liberal handful of blood and bone mixed into the soil around each crown will usually give good results.

Good drainage is important and the site of a new bed should be trenched or deeply dug and perennial weeds such as couch grass, oxalis, or convolvulus removed. If necessary, the area can be drained by field pipes or by the deep burial of open, stony material to form a moraine drain. Because it is a perennial, rhubarb is frequently planted at the end of a garden where it will not interfere with the digging over of the garden plot, and it is often at a boundary fence that couch or convolvulus is most troublesome. Whether rhubarb is to be planted or not, August is a good time to dig along boundary fences and to remove all perennial weeds.

Unless rhubarb planted this spring makes exceptionally good growth, no stalks should be pulled this year; even next season discretion should be exercised, as the pulling of stalks is exhausting to the plant and future development is likely to be seriously affected by too heavy pulling.

Many good varieties of rhubarb are available and a selection may be made of early, main-crop, and ever-bearing varieties, though in moist soils and in a suitable climate most varieties will

continue some growth throughout the year. For very small gardens an ever-bearing variety is probably preferable, but where space permits and if rhubarb is popular, all three kinds should be planted. As varieties sold are often variable, it is advisable where possible to choose a variety the quality and vigour of which are known to be good.

Senior Promotion in Department of Agriculture in South Island

MR G. K. McPHERSON, formerly Superintendent of the Department of Agriculture's Winchmore Irrigation Research Station, Ashburton, has been appointed Fields Superintendent of the Department at Dunedin. He succeeds Mr A. G. Elliott, who recently retired.



Mr McPherson.

Mr McPherson is very well known to Mid Canterbury farmers, having transferred to Ashburton from Ruakura as an Instructor in Agriculture in 1935. His particular field has been irrigation farming.

The Winchmore Irrigation Research Station was opened in 1947 and Mr McPherson was appointed Irrigation Research Officer there in 1949. Under his guidance the work at Winchmore has progressed very satisfactorily and has made major contributions to irrigation farming in Canterbury. In 1954 Mr McPherson visited Australia to study irrigation practices and experimental work there.

Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during March 1959 and for the eight months ended 31 March 1959 with comparative figures for the same month and the eight months of 1957-58 have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:

BUTTER					
Period		Creamery (tons)	Whey (tons)	Total (tons)	Percentage Inc. or dec.
March 1959	.. .. .	13,955	245	14,200	—
March 1958	.. .. .	14,098	263	14,361	—
Increase or decrease	.. .. .	—143	—18	—161	—1.121
8 months ended 31/3/59	.. .. .	159,921	2,357	162,278	—
8 months ended 31/3/58	.. .. .	156,034	2,514	158,548	—
Increase or decrease	.. .. .	+3,887	—157	+3,730	+2.352

Butter in store at 31 March 1959 was 33,985 tons

CHEESE					
Period		White (tons)	Coloured (tons)	Total (tons)	Percentage Inc. or dec.
March 1959	.. .. .	6,165	1,501	7,666	—
March 1958	.. .. .	6,645	1,268	7,913	—
Increase or decrease	.. .. .	—480	+233	—247	—3.121
8 months ended 31/3/59	.. .. .	54,551	13,376	67,927	—
8 months ended 31/3/58	.. .. .	66,331	11,565	77,896	—
Increase or decrease	.. .. .	—11,780	+1,811	—9,969	—12.797

Cheese in store at 31 March 1959 was 21,020 tons

If these figures are converted into butterfat equivalent, there is a increase of 0.026 per cent in butterfat graded for the eight months as compared with the preceding season. The above figures refer only to butter and cheese graded for export, and owing to diversions which may take place they are not necessarily a true indication of production trends.

Powdery Mildew of the Apple

By C. E. WOODHEAD,
Pip Fruit Specialist,
Department of Agriculture,
Palmerston North



Fig. 1—An apple leaf infected with powdery mildew (left) compared with a healthy leaf. [Shell

POWDERY mildew, caused by the fungus *Podosphaera leucotricha*, is a serious disease of apple orchards in New Zealand. Though prevalent throughout the country, it causes the greatest damage in the fruit-growing districts of Marlborough, Canterbury, and Central Otago. Where control measures are neglected the injury caused by this fungus to foliage, shoots, leaf and blossom buds, and fruit of susceptible varieties weakens the trees and seriously reduces the quantity and quality of the crop.

IN New Zealand, apple powdery mildew may also attack pears and quinces, but is of minor importance as a disease of these fruits. Apple varieties show varying degrees of resistance, some being very susceptible and others highly resistant. Varieties that may be severely affected include Jonathan, Cox's Orange, Gravenstein, Sturmer, Lord Wolseley, Dunn's Favourite, and Cleopatra. Northern Spy, much used as a rootstock for apple trees, is also highly susceptible.

Symptoms

Powdery mildew attacks leaves, shoots, leaf and blossom buds, and fruits. Infected trees have an unthrifty appearance owing to partial loss of foliage and the presence of numerous shoots with bare tips on which the fungus may be seen as a white coating.

On leaves early symptoms appear as small, white or grey, cobwebby patches on the undersurface. These patches gradually extend over both surfaces and may cover the whole leaf, which then appears to be coated with a white powder owing to the masses of fungous spores (Fig. 1). Infection of leaves first occurs as they emerge from the bud in spring; the fungus then spreads from these leaves to others developing later on the shoot. Infected leaves are narrower and longer than normal leaves and become distorted by the

upward and inward curling of the leaf margins (Fig. 2). Later they develop a scorched appearance, become brittle, and finally fall to the ground.

Infection spreads from the leaves to the shoot soon after it begins to grow. Growth of the shoot is retarded and buds formed are small and closely spaced. When the shoot is severely infected the tip is killed, and the following season bunched and stunted laterals develop below the dead portion (Fig. 3). As stated before infected shoots are covered with a white coating, the mycelium or vegetative portion of the fungus.

Diseased blossom buds are smaller than healthy buds and may be identified by their covering of white mycelium. The blossoms, which appear later than those from healthy buds, are distorted, abnormal in colour, and rarely set fruit.

Developing fruits may be attacked soon after the blossom period, the fungus causing damage to the delicate skin. As they near maturity this injury appears as a fine tracery of russet (Fig. 4) or as scabbed and deformed areas. Concentric cracks may also occur, which when fruit is in storage afford entry to fruit-rotting fungi.

Cause

From spring onward throughout the growing season the fungus which causes apple powdery mildew produces



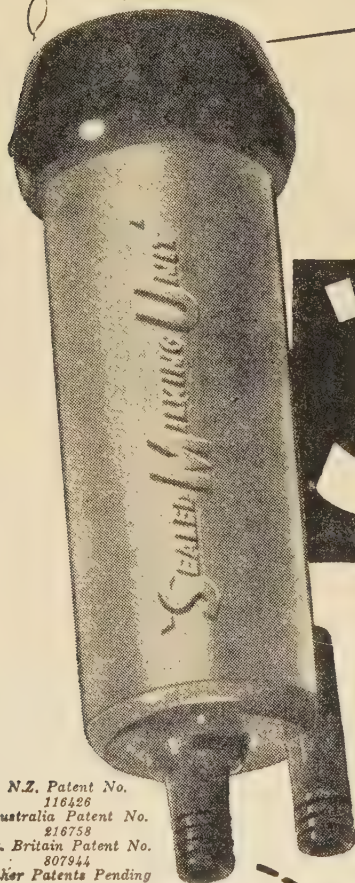
Fig. 2—Tip of a Sturmer apple → lateral attacked by powdery mildew. Further growth is prevented and the later-formed leaves remain small and strongly curled. D.S.I.R. photo

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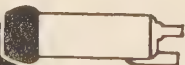
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conidial spores on the white mycelium covering infected leaves and shoots. As the spores are carried by the wind and are produced in vast numbers, the disease may spread rapidly over wide areas. In late summer other spores, termed ascospores, are formed in minute, black, fruiting bodies in the mycelium, but these are now considered to play no part in spreading the disease.

Powdery mildew is most troublesome in late summer and early autumn. The spores are produced in the greatest abundance during dry summers. Conditions favouring the subsequent germination of spores and infection of foliage include a temperature above 65 degrees F, dry weather, and the presence of young growth on the trees. Recent investigations in other countries have shown that, unlike those of many other fungi, powdery mildew spores will germinate on and infect dry foliage and, further, that no infection occurs during periods of rain. Consequently the disease is most prevalent and severe in districts of low rainfall or during droughts in wetter climates.

Powdery mildew is carried over from year to year by the mycelium on infected buds, shoots, and spurs or within the bud scales. The fungus is dormant through winter, but in spring produces the conidial spores which infect the young, emerging leaves and start a new cycle of infection.

Economic Importance

The disease is most serious in Central Otago, Canterbury, and Marlborough, all of which have a low rainfall. In recent years, however, mildew has increased in other districts, including Hawke's Bay and Nelson, where it was formerly of little importance. This increase is attributed to the displacement of sulphur sprays by organic fungicides such as carbamates, captan, and mercury, which do not control mildew.

When neglected, powdery mildew may seriously impair the vigour and cropping of trees through the following types of injury:

Damage to leaves and partial loss of foliage, by reducing the vigour of the tree, affect both the quantity and quality of the crop. Any reduction of leaf area also reduces the number of blossom buds formed, thus affecting production in the following year.

The killing of shoots decreases the amount of new wood available for fruit production or for building up the tree's framework.

Infection of blossom buds directly affects production, as infected blossoms rarely set fruit.

The market value of the crop is lowered by the russetting and cracking of the fruit.

Control

Pruning

As powdery mildew overwinters on infected shoots and spurs and in bud scales, the first step toward control is to remove and burn all visibly infected wood at the winter pruning.

Where infection is light or moderate all visibly infected shoots should be cut out during the first winter. In heavily infected orchards, however, the removal of all infection in one year would be too costly and time consuming. Further, to carry out the operation at reasonable speed the loss of many healthy buds and a consequent reduction of crop would be unavoidable.

Recent investigation by the Department has shown that a more gradual removal of infected wood over the first two years, followed by an intensive effort in the third year, causes less disruption of cropping and is equally effective in controlling mildew.

Cutting out visible infection will not give complete control, however, as much infection will remain hidden in bud scales. Further, there is a constant danger of infection by wind-borne spores from adjacent orchards. Therefore, for mildew control to be effective, pruning should be combined with a programme of spraying which will adequately protect healthy foliage and shoots.

Spraying

In districts where powdery mildew is severe, as in Central Otago, and for varieties of fruit susceptible to both mildew and black spot, sprays should be applied according to the schedule below.

As spring is the most critical period in mildew control, the importance of applying the green tip and blossom



Fig. 3—An apple shoot infected the previous season, showing bunched and small laterals and close and small buds. Affected shoots have a white coating of fungus.

period sprays cannot be over-emphasised.

In a recent 3-year trial by the Department on Jonathan trees at Roxburgh in Central Otago a spray schedule based on the new materials "Sulfane" and "Karathane" controlled

Time of application	Spray	To make 100 gallons of spray mix with
1. Green tip	Lime sulphur 1 : 30	3½ gallons water
2. Tight cluster	Lime sulphur 1 : 80	1½ gallons
3. Open cluster to pink	Lime sulphur 1 : 100	1 gallon
4. Petal fall	Lime sulphur 1 : 150	½ gallon
	plus colloidal sulphur (70 per cent) 1 : 100	1 lb
5. 10 days later	Lime sulphur 1 : 150	½ gallon
	plus colloidal sulphur (70 per cent) 1 : 100	1 lb
6. 18-day intervals to end of season	Lime sulphur 1 : 150	½ gallon
	plus colloidal sulphur (70 per cent) 1 : 100	1 lb

On russet-susceptible varieties lime sulphur should be omitted from the petal fall and later sprays and the colloidal sulphur increased to 2 : 100.

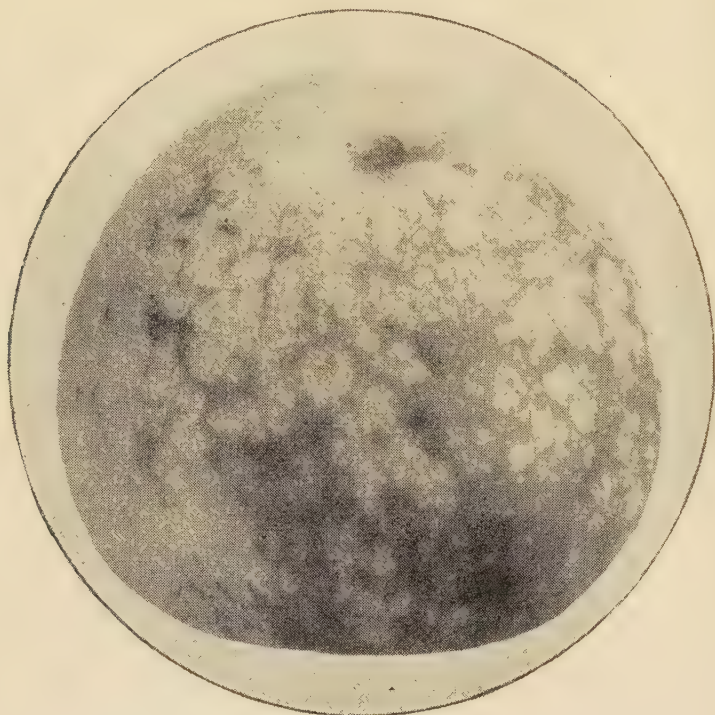


Fig. 4—A Dunn's Favourite apple russeted as a result of early infection. Though it is not noticeable in the illustration, the near side of the apple is much deformed.

Time of application	Spray	To make 100 gallons of spray mix with water
1. Green tip	Lime sulphur 1 : 30	3½ gallons
2. Tight cluster	"Sulfane" 2 : 100	2 lb
3. Open cluster to pink	"Sulfane" 2 : 100	2 lb
4. Petal fall	"Sulfane" 2 : 100	2 lb
5. 10 days later	"Sulfane" 2 : 100	2 lb
6. 18-day intervals to end of season	"Karathane" 1 : 100	1 lb

mildew more effectively than the sulphurs and gave fruit of improved colour and finish. In addition, the foliage was greener and in better condition at the end of the season. The alternative spray schedule above is therefore recommended for varieties that are heavily infected with powdery mildew but are not very susceptible to black spot.

The cost of materials in this spray schedule is more than double that of the sulphurs. Against this, however, must be balanced the prospect of increased crops as the result of more effective control of mildew.

In districts where powdery mildew is of secondary importance to black spot and ripe spot it may be necessary to modify or largely replace the lime sulphur-colloidal sulphur schedule with other materials. In spray programmes which are based on organic fungicides and therefore tend to cause a build-up of mildew, it is essential,

however, to include in the early sprays a material to control this disease. From the results of recent trials by the Department, "Sulfane" is considered the most effective material for this purpose. For further information on spray schedules and the compatibility of "Sulfane" with other spray chemicals the district Horticultural Instructor should be consulted.

References

1. G. H. Cunningham, "Powdery Mildew in the Orchard", New Zealand Department of Agriculture Bulletin No. 112, 1947.
2. R. M. Brien and J. M. Dingley, "A Revised List of Plant Diseases Recorded in New Zealand", Department of Scientific and Industrial Research Bulletin No. 101, 1951.
3. R. Aerts and A. Soenen, "Comptes Rendus de Recherches", No. 15, p. 57, Belgium, 1955.
4. J. D. Atkinson and others, "Plant Protection in New Zealand", New Zealand Department of Education, 1956.
5. R. C. Woodward, "The Commercial Grower", No. 3242, p. 386, England, 1958.

"Bibliography of New Zealand Tussock Grasslands":

Helen M. Drummond and
E. H. Leatham

BULLETIN 132 of the Department of Scientific and Industrial Research is a welcome and valuable record of literature dealing with the botanical aspects of tussock grasslands published from 1859 to 1957. Over 300 references are made to literature by about 160 named authors and about a dozen that are anonymous or related to organisations.

This bulletin should be useful to all who are interested in the history and use of tussock grasslands.

Analysis of the literature referred to shows that in the early years only a small amount was published. Much of this is, however, of considerable significance to the research worker of today, because it records the condition of the tussock grassland when it had not been modified to the extent that it is now.

For the period 1359 to 1909 there are only 20 references. There is then a sudden upsurge of publications, there being some 43 references for the decade 1910 to 1919. For several subsequent decades the numbers are fairly constant, varying from 31 to 50.

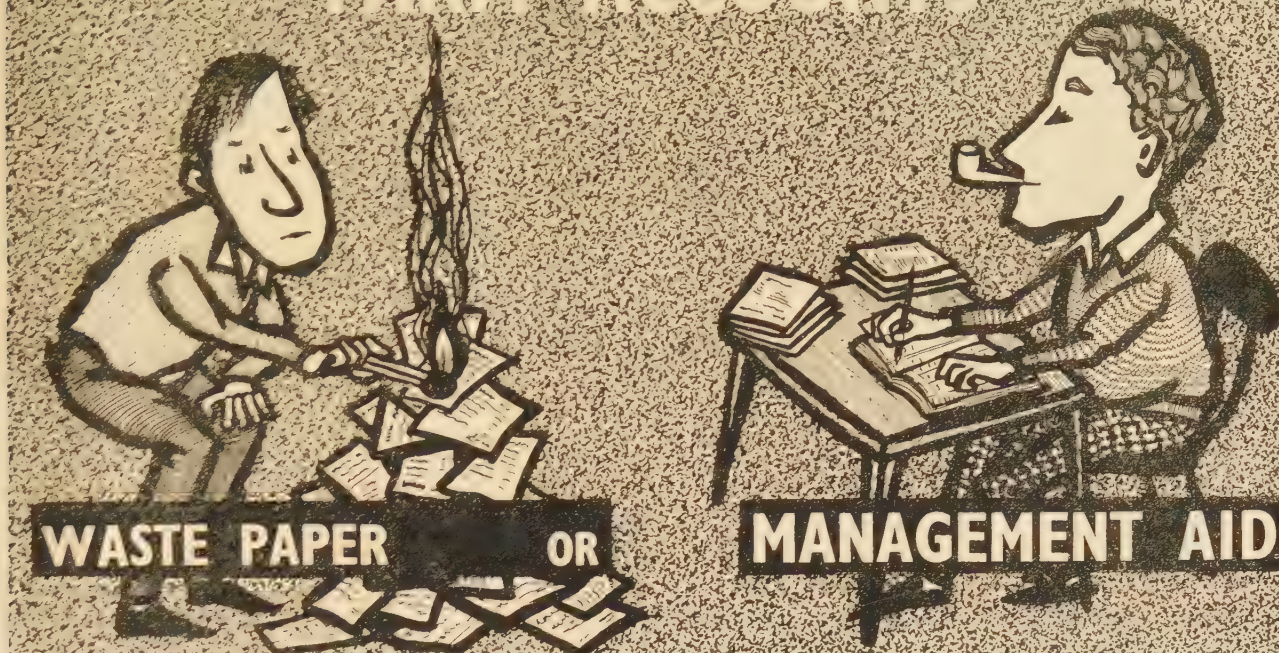
It is since 1950, however, that work and resulting publication of work has increased to the greatest extent. For the period 1950 to 1957 there are about 130 references. This sudden increase is a reflection of the increased interest being taken in tussock grassland by research workers, advisory officers, and runholders.

Publications of the Department of Agriculture, the Department of Scientific and Industrial Research, and the Transactions of the New Zealand Institute and the Royal Society of New Zealand account for about half the references. Matters relating to tussock grasslands were the subject of at least 28 theses by students.

—S.H.S.

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FARM ACCOUNTS



A NNUAL farm accounts (that is, the farm trading account and balance sheet as prepared in New Zealand by public accountants for their farmer clients) frequently serve no purpose other than satisfying the requirements of the Inland Revenue Department. Admittedly many farmers carefully file the accounts with their other papers, but the possibilities of their use as a farm management aid do not occur to them and the material represents little more than waste paper.

IN this article the actual farm trading account for the year ended 30 June 1958 for a Taranaki dairy farm is analysed to show that beside meeting the requirements of the taxation authorities it can tell a story to the farmer, particularly if compared with some production and economic standards for similar-sized farms on the same soil type.

The Farm and the Farmer

The farm comprises 115 acres of flat land, the soils being of a sandy nature derived from ash from Mt. Egmont. Good pasture responses are obtained from the application of phosphate and potash. The annual rainfall is between 70 and 80 in. and is well distributed throughout the year. The farm is rectangular and is well laid out with a central race, and has a new cowshed about a third of the distance along the race toward the back of the farm.

The farmer is held in high esteem in his district and is always in the forefront in the adoption of new ideas and new management techniques.

The particular soil on which the farm is situated was considered in the Soil Bureau Bulletin (n.s.) 5, "Soils

of the North Island, New Zealand", published in 1954, to have a potential production of 220 lb of butterfat per acre. The farm now has a production of over 250 lb of butterfat per acre, or 30 lb per acre above the assessed potential.

The Trading Account

The farm trading account is set out on page 59, and the farmer also made available particulars of the butterfat production for the year, the number of cows he had milked, and the latest Government valuation of his farm as shown on his county rate demand.

In addition he supplied a detailed list of his livestock at the beginning of the farming year (1 July 1957) and a similar list for the end of the year (30 June 1958); also a list of his machinery and equipment at these dates with an indication of their age.

The livestock were subsequently given a conservative market value, which is much more realistic than the standard £7 per head for all classes of dairy stock as adopted in the trading account. The machinery and equipment were given normal resale values based on the prices ruling for some-

what similar equipment at farm clearing sales.

Supplementary Information

The supplementary information supplied by the farmer was:

Butterfat production 1957-58: 28,500 lb
Government valuation of farm: £12,700
Value placed on lists of livestock:

at 1/7/57 £3,150 } Mean value: £3,125
at 30/6/58 £3,100 }

Value placed on lists of machinery and equipment:

at 1/7/57 £2,052 } Mean value: £2,017
at 30/6/58 £1,983 }

Number of cows milked: 82

The butterfat figure was for production at the pail and was arrived at by taking the amount of butterfat supplied to the factory for the year (28,200 lb) and adding to it an amount to allow for milk consumed by those living on the farm and for whole milk fed to calves. The farmer was able to supply reasonably accurate information on the quantity of milk used on the farm; in terms of butterfat it was equivalent to 300 lb.

The 82 cows milked represent the number which milked for 100 days or more during the 1957-58 season.

By R. H. SCOTT,
Land Utilisation Officer,
Department of Agriculture,
Wellington



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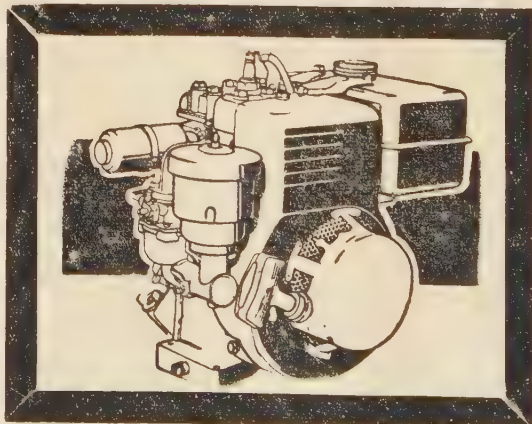
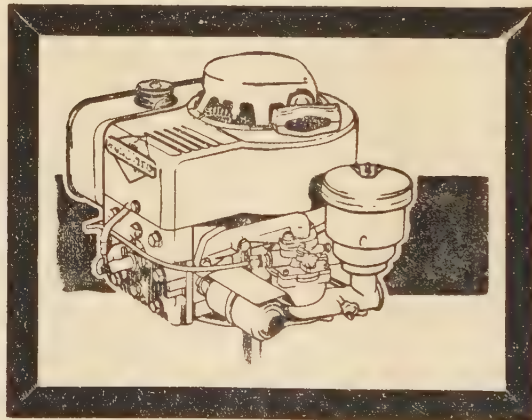
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Carrying Capacity and Physical Production

The first factor which can be computed is the carrying capacity of the farm, and for dairy farms this is usually assessed on the basis of the number of cows per 100 acres. All stock on the farm were converted to a common stock unit, in this case the dairy cow.

The carrying capacity was equal to 88 dairy cows per 100 acres. From information available to the Department it appears that the carrying capacity on somewhat similar-sized farms on this soil type was about 79 dairy cows per 100 acres, which shows that carrying capacity was well above average.

The two production factors are the average butterfat production per cow and the butterfat production per acre. The average production of 348 lb per cow was about 11 lb above the average for similar-sized farms on the soil type and 64 lb above the effective average production per cow as assessed by the New Zealand Dairy Board for Taranaki for that season. However, as the two sets of figures are computed on a different basis, the difference is probably not as great as 64 lb. The per acre production of 248 lb was 33 lb above the average of similar-sized farms. Table 1 sets out the figures.

TABLE 1—CARRYING CAPACITY AND PRODUCTION FOR FARM AS COMPARED WITH AVERAGES FOR SIMILAR-SIZED FARMS ON SAME SOIL TYPE

	Farm	Average for similar-sized farms on same soil type
Carrying capacity per 100 acres ..	88 dairy cows	79 dairy cows
Butterfat per cow ..	348 lb	337 lb
Butterfat per acre ..	248 lb	215 lb

The physical indices indicate that the farmer could be reasonably satisfied with the performance, but this is only part of the story. High physical results can sometimes be achieved at too great a cost, and it is therefore necessary to analyse some of the financial data and compare these with the standards.

Analyses of Financial Data

Before comparisons can be made between financial figures for a farm and economic standards for somewhat similar-sized farms on the same soil type it is necessary that the two sets of financial data be calculated on the same basis.

The first step in the analysis is to make the necessary adjustments in the trading account. Some expenditure items were rearranged and some were amalgamated, the amalgamations being as follows:

Fixed Charges

This item comprised the following in the trading account:

	£	s.	d.
Insurance	15	16	2
Rates	106	15	5
Telephone and tolls ..	39	16	5
	162	8	0

Tractor and Car Expenses

This comprised the following two items:

	£	s.	d.
Tractor expenses ..	143	8	1
Car expenses ..	29	10	6
	172	18	7

Dairy Shed and Herd Expenses

The item comprised:

	£	s.	d.
Power at dairy shed ..	55	4	11
Herd testing and A.B. fees	111	0	6
Shed requisites	37	5	3
Vet. fees	35	0	11
	238	11	7

The adjustments made were as follows:

Wages

The total figures should include an allowance for the manual work of the farmer, and the amount of £720 shown under wages in the trading account was increased by £624 or £12 per week.

TRADING ACCOUNT FOR YEAR ENDED 30 JUNE 1958

	£	s.	d.		£	s.	d.
To stock on hand 1/7/57				By butterfat	4,742	8	7
82 cows at £7	574	0	0	„ sale cows	288	5	10
17 in-calf heifers at £7 ..	119	0	0	„ sale bobby calves ..	107	10	3
16 heifers rising 1 yr. at £7	112	0	0	„ domestic produce ..	10	0	0
1 bull	7	0	0				
				By stock on hand 30/6/58			
To repairs and maintenance				82 cows at £7	574	0	0
„ power	55	4	11	16 in-calf heifers at £7 ..	112	0	0
„ cartage	13	13	6	14 yearling heifers at £7 ..	98	0	0
„ tractor expenses ..	143	8	1	2 bulls at £7	14	0	0
„ wages	720	0	0		798	0	0
„ car expenses	29	10	6				
„ interest on mortgages	171	1	8				
„ insurance	15	16	2				
„ rates	106	15	5				
„ manure and seeds ..	553	14	7				
„ herd testing and A.B. fees	111	0	6				
„ stock foods	23	0	0				
„ shed requisites	37	5	3				
„ telephone and tolls	39	16	5				
„ vet. fees	35	0	11				
„ sundry expenses ..	28	4	0				
„ depreciation	469	3	5				
Net farming income ..	2,306	9	4				
	5,946	4	8				

FARM ACCOUNTS

Repair and Maintenance

The farmer was able to supply information to enable this item to be divided under two headings.

Repairs to buildings, fences, etc.	£ 255
Repairs to machinery (other than tractor and car) ..	20

Interest on Mortgage

The amount of £171 1s. 8d. under this heading was omitted, and in its place there was allowed an amount equal to 5 per cent of the value of the land and improvements, livestock, and machinery and equipment. Some farms are heavily mortgaged, while on others the amount on mortgage is very low. By omitting any actual interest payments on mortgages and making the above allowance care is taken of any interest charge on mortgages as well as allowing a farmer interest on his equity in the enterprise.

The value of livestock, machinery, and equipment was the mean of the value of these items at the beginning and end of the farm trading year.

Depreciation

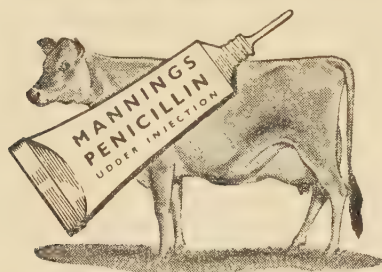
Depreciation was adjusted by omitting any special allowances, such as high initial allowances on some assets, as these are really in the nature of concessions and are not realistic when making comparisons between figures for one farm and economic standards for an area.

Livestock

Livestock were revalued at a conservative market rate with the result that at 1/7/57 the value was £3,150 and at 30/6/58 it was £3,100. This showed a reduction of £50 in the value of livestock at the end of the year as compared with the value at the beginning of the farming year. The modified trading account after making the amalgamations and adjustments is shown on page 61.

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The gross output was £5,098 and if this is converted to a per acre and per stock unit basis, we get the following comparison with the average for the soil type.

TABLE 2—GROSS OUTPUT PER ACRE AND PER STOCK UNIT FOR THE FARM COMPARED WITH THE AVERAGE FOR SIMILAR-SIZED FARMS ON THE SAME SOIL TYPE

	Farm	Average for similar-sized farms on same soil type
	£	£
Gross output per acre ..	44.3	39.0
Gross output per stock unit ..	50.4	49.2

The farmer was above average and it could be claimed that he was running his farm quite intensively.

The next step is to arrive at some index of efficiency which we shall call "owner surplus", and as will be seen from the modified trading account it is in the nature of a management reward to the farmer. It is really the amount available to the farmer to meet taxation and for any reinvestments he may wish to make in the enterprise. While it cannot be claimed to be the perfect index of efficiency, it indicates a farmer's efficiency in combining and using his resources. Here again the farmer rated above average as shown by Table 3.

TABLE 3—OWNER SURPLUS PER ACRE AND PER STOCK UNIT FOR THE FARM COMPARED WITH THE AVERAGE FOR SIMILAR-SIZED FARMS ON THE SAME SOIL TYPE

	Farm	Average for similar-sized farms on same soil type
	£	£
Owner surplus per acre ..	8.5	6.3
Owner surplus per stock unit ..	9.7	7.9

Though the indices so far show the farm to be an efficient producing unit, this does not mean that there are no weaknesses in the enterprise, and the next step is to compare some of the main expenditure items or inputs with the average for the soil type.

Comparison of each item with the averages shows the farm in a good light and the only figure that may call for some comment is that for fertiliser and seed which on a per stock unit basis is £0.8 higher than average. On the other hand this farmer has a

MAIN EXPENDITURE ITEMS PER STOCK UNIT

Expenditure	Farm	Average for farms of similar size on same soil type
	£	£
Wages ..	13.3	14.2
Repairs and maintenance ..		
Buildings, fences etc ..	2.5	2.5
Machinery ..	1.2	1.2
Fixed charges ..	1.6	1.3
Tractor, truck, and car expenses ..	1.7	1.8
Fertiliser and seed ..	5.5	4.7
Dairy shed and herd expenses ..	2.4	2.7
Depreciation on buildings ..	1.3	1.0
Depreciation on machinery and plant ..	2.8	2.5
Interest on value of land and buildings ..	6.3	6.3
Interest on value of livestock ..	1.5	1.5
Interest on value of machinery and equipment ..	1.0	1.0

higher net return per acre and per stock unit and the higher expenditure on fertilisers may be a contributing factor to the satisfactory net return.

While the other items call for no specific comment, some general remarks can be made on some of them.

Wages

On another farm in the district it was found that the item wages amounted to £16.4 per stock unit, which is £2.2 higher than average. On the farm there is the farmer and a full-time employee, but in effect the carrying capacity of the farm is not sufficient to sustain the full-time employee.

Under a system which prescribes minimum wage rates, wages particularly of permanent employees become fixed charges, or at least they become rigid. A farmer cannot reduce the wages of an employee nor can he terminate the employee's services unless he reduces production. In such conditions, where it is possible, the farmer should quickly build up the carrying capacity of the property so that each labour unit is handling the optimum number of stock.

Machinery Costs

The total expenditure per stock unit for machinery amounted to £5.7

FARM ACCOUNTS

against the average of £5.5. However, on another farm in the district the expenditure on machinery was £6.8 per stock unit. This appeared high, but the farm was really a one-man unit on which a little casual labour was employed, and the higher cost for machinery was really an offset to labour.

Labour and machinery are largely substitutes and if a farmer spends large amounts on machinery, he should in theory employ less labour, and vice versa. This was the case on this farm, for the total expenditure per stock unit on labour and machinery was £19.2 against the average of £19.7 per stock unit.

On factory supply dairy farms the matter can be looked at in another way by comparing the output of butterfat per £100 labour and machinery. For the farm it was £258 per £100 labour and machinery against the average of £251.

Management Aid

If analysed on the above lines, some farm accounts as prepared by public accountants can tell a story to farmers and if compared with standards for similar-sized farms on the same soil type or land class, they can help to pinpoint weaknesses in a farm enterprise.

Unfortunately at present there are few areas in New Zealand for which production and economic standards have been compiled, but standards are expected to be available for additional areas within the next two years.

Any such standards will be based on those farms which are yielding the highest continuing net income. However, as farming is a dynamic industry, any standards for a land class will alter, and thus they will have to be reviewed periodically.

A definite difficulty in comparing a set of accounts with standards is that there is really no standard classification for farm accounts, and frequently they do not include any details of the physical production from the farms. If these objections are overcome and public accountants with farmer clients prepare the annual accounts on a standard basis and there is a standard classification for expenditure items, it would be a step toward improved farm management advisory work and farm management research work in the Dominion.

However, any dairy farmer who is interested in having his annual accounts analysed on the lines set out can receive assistance from the farm economists of the Extension Division stationed at Auckland, Hamilton, Palmerston North, Christchurch, and Dunedin.

Acknowledgments

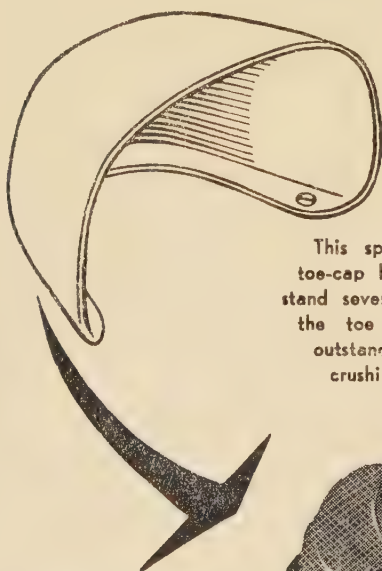
The writer acknowledges the help of the Taranaki dairy farmers who made available their accounts.

MODIFIED TRADING ACCOUNT

Costs			Returns		
	£	s. d.		£	s. d.
Wages ..	1,344	0 0	Butterfat ..	4,742	8 7
Repairs and maintenance ..			Cows ..	288	5 10
To buildings, fences, etc. ..	255	0 0	Bobby calves ..	107	10 3
To machinery ..	20	0 0	Produce used on farm ..	10	0 0
Fixed charges ..	162	8 0			
Tractor and car expenses ..	172	18 7		5,148	4 8
Fertiliser and seed ..	553	14 7	Less decrease in value of livestock ..	50	0 0
Fodder ..	23	0 0			
Dairy shed and herd expenses ..	238	11 7			
Cartage ..	13	13 6			
Sundry expenses ..	28	4 0			
Depreciation ..					
On buildings ..	134	0 0			
On machinery and equipment ..	278	5 10			
Interest at 5 per cent on ..					
Value land and buildings ..	635	0 0			
Value livestock ..	156	5 0			
Value machinery and equipment ..	100	17 0			
Total inputs ..	4,115	18 1			
Owner surplus ..	982	6 7			
	5,098	4 8		5,098	4 8

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Crop Production

BARLEY

By N. L. SHILLITO,
Seed Production Officer,
Department of Agriculture,
Christchurch

NEXT to wheat, barley is the most important grain crop in New Zealand, occupying about 60,000 acres. Canterbury is the main barley area and grows almost three-quarters of the total. The Wellington, Nelson-Marlborough, and Otago districts each grow less than one-tenth and the balance is spread among other districts, mainly Hawke's Bay, Gisborne, and Southland.

THE total production of barley is approximately 2½ million bushels, of which about 1½ million are used for malting. A further 140,000 bushels are required for seed and about 40,000 bushels are used for pearling. The balance is used as stock feeds of various types. Normally New Zealand can be considered as self sufficient in barley production, with occasional imports in poor seasons and sometimes limited exports when supplies have built up.

Suitable Soils

Barley can be grown in most areas where grain growing is a general practice. Provided the soil is of medium fertility and the weather at harvest is suitable for drying the grain, barley gives satisfactory returns. Barley prefers a well drained, free-working loam of medium fertility for best results, and the soil should be neutral or slightly alkaline. It is a shallow rooting and quick growing crop and is, therefore, susceptible to unfavourable conditions during the growing period. Wet, cold conditions after sowing; caking of the seedbed before emergence, and dry weather during the later stages of development can all have a serious effect on the ultimate yield.

As most of the barley grown in New Zealand is used for malting, the production of a sample suitable for this purpose is usually the object in growing this crop. One of the requirements of the maltster is that the grain should have a low nitrogen content. With the recent upward trend in soil fertility there has been a corresponding spread of barley growing away from the heavier areas which have been regarded traditionally as barley growing land on to the lighter soils, which at present are at a very high fertility level. These soil types have proved most satisfactory

from the quality angle and have also given good, reliable yields per acre.

Climate

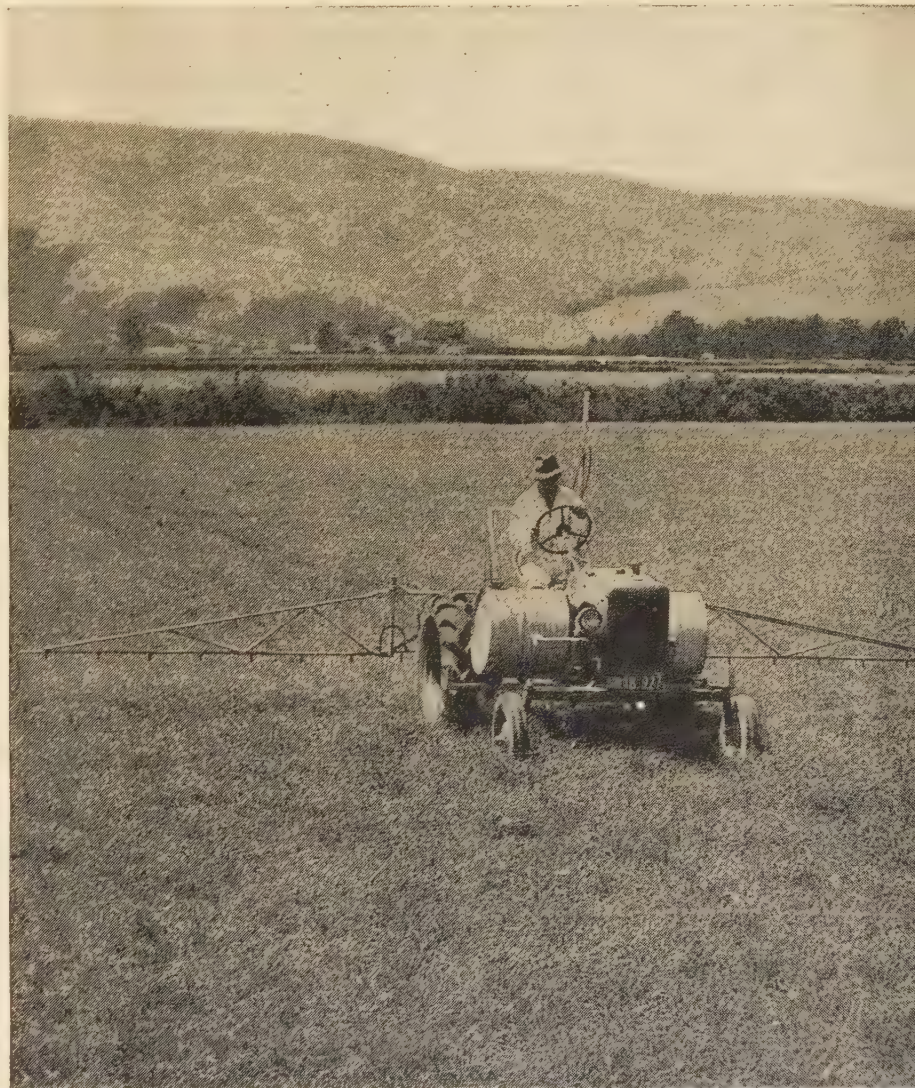
A suitable climate for barley should provide adequate moisture during the growing period and yet when harvesting is in progress the weather should be such that a good grain can be obtained. Malting depends on the germination of the grain as the basis

of the process, and unless good drying conditions prevail at harvest, it is difficult to obtain good, plump lines of barley capable of high, uniform germination. Some barley is windrowed before threshing and once in the windrow it is far more susceptible to sprouting and discolouration than a crop which is left standing.

Place in Rotation

Barley can be fitted practically anywhere into a crop rotation. As it is usually a spring-sown crop, it fits in quite well after winter forage crops such as roots and chou moellier. It is also a suitable crop to follow

▼ Spraying barley at the correct stage for weed control.





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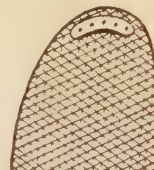
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PREPARING THE GROUND FOR BARLEY PRODUCTION

potatoes, which are often harvested too late for wheat to be sown in good time.

Wheat crops are often followed by barley, and on heavy land a further barley crop can again follow this. In fact it is not uncommon for several barley crops to follow one another and give satisfactory yields. It is suitable as a first crop after grass on dairy farms where the paddock is required for feeding out until early spring. Under these conditions the paddock can be cultivated quickly and the barley sown in time for a successful crop.

Preparation of Ground

The cultivation necessary will, of course, be determined largely by the preceding crop and the soil type.

Where the crop follows grass some preliminary cultivation is usual before deep ploughing to break up the old turf. Preferably ploughing should be done as early as possible. The land is then best left in the furrow to weather during winter and be further cultivated when the soil has dried out in spring. This later working should aim at providing a well worked seedbed not too fine on the surface and at the same time obtaining strikes of annual weed seeds and destroying them with subsequent cultivations.

When barley follows another grain crop such as wheat or a previous crop of barley ample time is available to prepare the ground over winter and spring. When, however, the barley is to follow a winter fodder crop it is often rather late before feeding is completed. It is necessary, therefore, to carry out the first working as quickly as possible provided the ground is in a suitable condition. The aim is to allow time for a few top workings before drilling to destroy germinating weed seeds. At times on the lighter soils barley is sown in autumn. Under these conditions a much looser, rougher seedbed should be aimed at.

Sowing

Most barley for threshing in New Zealand is spring sown and sowings



Drilling barley in a well prepared seedbed.

can be spread over a long period. Actual sowing dates are determined by various factors many of which cannot be controlled such as weather, soil type, etc. Late August until mid October may be considered the most satisfactory period to sow barley under average conditions, but under special circumstances this period can be extended and good yields obtained from sowings as late as November. Barley prefers a warm, not-too-wet seedbed and generally it is advisable to delay sowing until conditions are favourable. For autumn sowing May to mid June is the most suitable period, so that the barley emerges rapidly and becomes established before the weather becomes too severe.

Seed rates for barley do not vary a great deal. For spring-sown malting barley 2 bushels per acre is the standard seeding, and this is usually reduced slightly for autumn sowing.

Barley should not be drilled too deeply, as it is very susceptible to unfavourable conditions before emergence. Heavy rain after sowing can cake the surface of the soil and seriously affect the emergence of the seed. It is desirable to get the barley through the ground as quickly as possible.

Cultivation after the crop is up should be restricted to the minimum. Sometimes the crop is harrowed to

kill weeds, but with chemical weed control now practicable harrowing would be best confined to cases where heavy rain has formed a crust on the surface of the soil. Rolling is also practised to level and firm the ground and in many cases will do quite a satisfactory job of breaking a surface crust without harrows being used.

Fertilisers

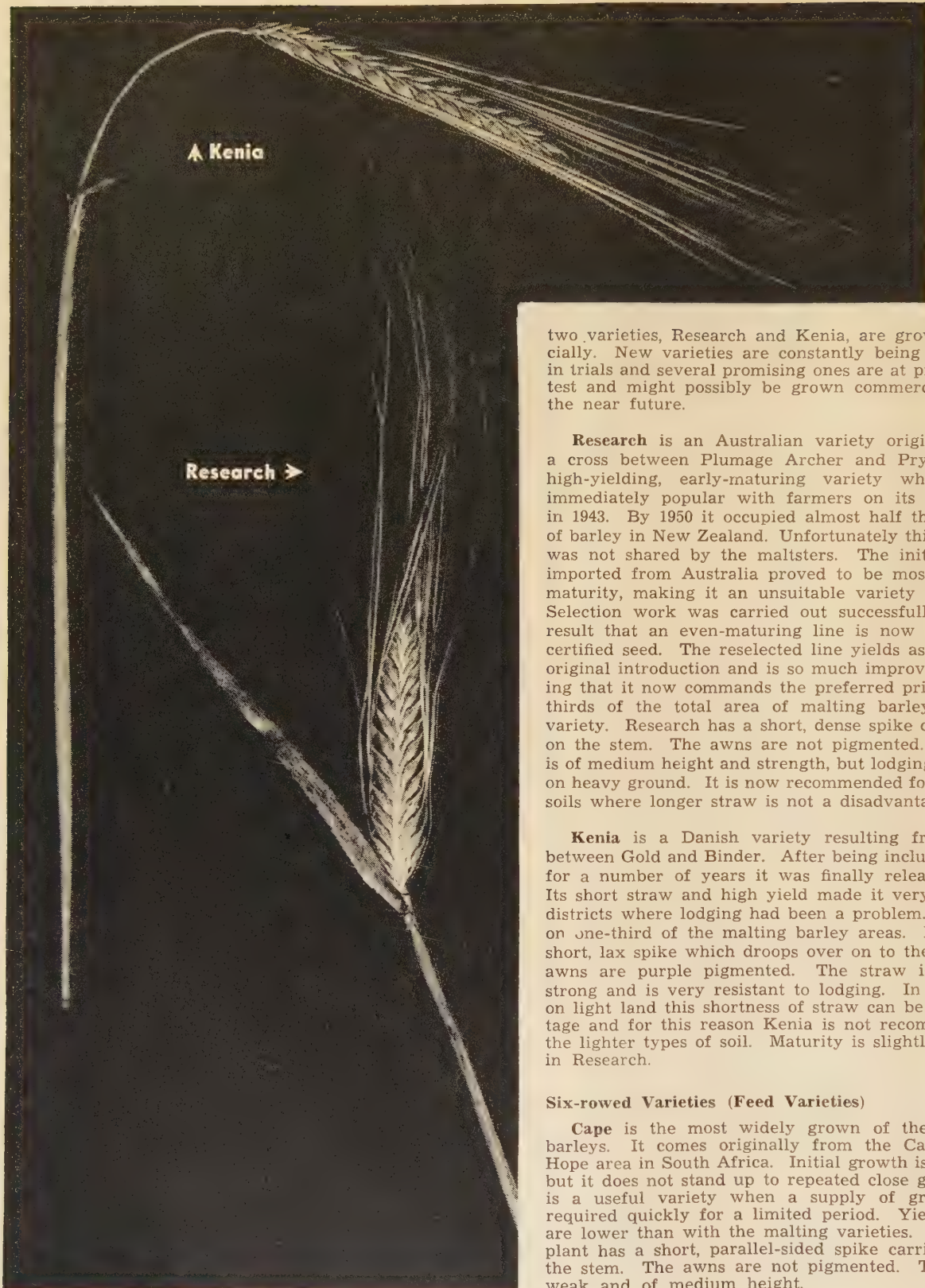
It is usual to sow barley with 1 cwt of superphosphate per acre. Nitrogen is sometimes used if the crop comes away slowly and looks yellow, but generally no other manure is applied after the initial 1 cwt of superphosphate.

Varieties

In New Zealand all malting barley and much of the barley used as grain for stock feeding comprises varieties of the two-rowed type. The six-rowed type is used solely as grain for stock feed or for green feed.

Two-rowed Varieties (Malting Barleys)

Before 1950 there were about eight varieties of malting barley grown in New Zealand. These older varieties were of good malting quality but did not suit the farmer for growing under the present harvesting systems. They have gradually lost popularity as newer, more satisfactory varieties have become available. At present only



two varieties, Research and Kenia, are grown commercially. New varieties are constantly being investigated in trials and several promising ones are at present under test and might possibly be grown commercially in the near future.

Research is an Australian variety originating from a cross between Plumage Archer and Pryor. It is a high-yielding, early-maturing variety which became immediately popular with farmers on its introduction in 1943. By 1950 it occupied almost half the total area of barley in New Zealand. Unfortunately this popularity was not shared by the maltsters. The initial material imported from Australia proved to be most uneven in maturity, making it an unsuitable variety for malting. Selection work was carried out successfully, with the result that an even-maturing line is now available as certified seed. The reselected line yields as well as the original introduction and is so much improved for malting that it now commands the preferred price and two-thirds of the total area of malting barley is of this variety. Research has a short, dense spike carried erect on the stem. The awns are not pigmented. The straw is of medium height and strength, but lodging is common on heavy ground. It is now recommended for the lighter soils where longer straw is not a disadvantage.

Kenia is a Danish variety resulting from a cross between Gold and Binder. After being included in trials for a number of years it was finally released in 1951. Its short straw and high yield made it very popular in districts where lodging had been a problem. It is sown on one-third of the malting barley areas. Kenia has a short, lax spike which droops over on to the stem. The awns are purple pigmented. The straw is short and strong and is very resistant to lodging. In dry seasons on light land this shortness of straw can be a disadvantage and for this reason Kenia is not recommended for the lighter types of soil. Maturity is slightly later than in Research.

Six-rowed Varieties (Feed Varieties)

Cape is the most widely grown of the green-feed barleys. It comes originally from the Cape of Good Hope area in South Africa. Initial growth is very quick, but it does not stand up to repeated close grazings. It is a useful variety when a supply of green feed is required quickly for a limited period. Yields of grain are lower than with the malting varieties. The mature plant has a short, parallel-sided spike carried erect on the stem. The awns are not pigmented. The straw is weak and of medium height.

Black Skinless is very popular with some farmers who consider it to be quicker growing than Cape in the early stages. It is considered to have originated in the northern part of India. The mature plant has a short, tapering spike which droops on the stem. The awns are purple pigmented. Straw is weak and of medium height.

Wong has given some excellent yields of green feed in trials, but generally has not performed well unless fertility was high and growing conditions were favourable. It stands up to repeated grazings much better than the other barleys.

Wong is a cross between a Russian two-row variety, **Orel**, and an unnamed Chinese six-row variety. It is a true winter cereal and must be autumn sown to produce seed. The spike is short and dense and carried erect on the stem. Awns are very short and not pigmented. The straw is of medium height and quite strong.

Seed Supplies

For malting it is important that the seed used is pure and free from disease, and the Department of Agriculture has included malting varieties of barley in its certification scheme. This ensures a supply of seed of known origin which has been field inspected for freedom from impurities and diseased plants. Recently it was found that some lines of seed were becoming infected with loose smut through being grown close to areas of Cape barley which was infected with this disease. Cape has now been included in the certification scheme, so that a regular supply of disease-free seed of this variety is also available to replace infected lines.

Weed Control

Barley is very susceptible to competition from annual weeds. These weeds germinate about the time the barley is sown and make rapid growth which enables them to compete with the crop, and if they are thick, they can cause serious smothering and subsequent loss of yield. Until recently cultivation was the only means of controlling these weeds, and under ideal conditions good control could be obtained by harrowing, etc., but often the weather was unfavourable and results were poor.

Chemicals offer the most satisfactory control of weeds in barley, and water-soluble preparations of MCP are the most suitable. Damage is likely to occur if the crop is sprayed before the six-leaf stage or after the emergence of the shot blade. Where annual weeds such as fathen are the main problem spraying should be done as early as possible. For perennial weeds such as Californian thistle spraying should be delayed until the thistles are well through the ground. When both types are present a compromise may be necessary to get some control over both.



Cape is the most widely grown of the green-feed barleys.

Harvesting

Practically all barley in New Zealand is now harvested by header harvester, either headed direct or cut and windrowed and subsequently threshed with the header with pick-up attachment. This means that the grain has little time to mature on the straw once harvesting has started. The malting process depends on a good, even-germinating line of grain and to obtain this it is important that the grain is fully mature before harvest.

... BARLEY PRODUCTION

When this stage is reached the straw should be completely dry with no green showing and the grain hard with the seed coat finely wrinkled.

Threshing should not begin until the moisture content is low, as grain going into store out of condition, that is, with moisture content of more than 15.5 per cent, rapidly loses its germination and is unsuitable for malting. Special care should be taken over header settings. The aim should be to operate the header with as slow a drum speed and as wide a concave setting as is consistent with satisfactory threshing of the grain. A good sample of barley can be ruined by too severe threshing causing broken, skinned, and otherwise damaged grains. These grains are usually incapable of germination and cause undesirable mould during malting.

Severe threshing may remove all the awns from the seed, and as a general guide a portion should be left. Therefore, drum speed and concave setting should be watched throughout the day, as conditions vary considerably during the working period and it is unlikely that the one setting will be satisfactory. The sample should also be watched for screenings and the screen adjusted to remove shrivelled grain.

A grading schedule for malting barley was drawn up in 1936 which lays down the percentages of the various impurities and damaged grains which are permissible for a line of barley to pass as No. 1 grade. Reduction in price can result if the line does not measure up in some respects or in extreme cases the line can be rejected entirely for malting and will have to be sold for feed.

Yields

Normally, barley yields higher than wheat. On good barley country yields of from 60 to 100 bushels per acre or better could be expected. The New Zealand average yield for a six-year period (1952-57) was 45 bushels per acre.

Barley as Green Feed

Barley is quite widely used as a green feed, particularly where feed is required quickly in late summer and early autumn. It is most suitable for areas where the fertility is reasonably high. As a general rule, barleys do not recover well after grazing, though the variety **Wong** is an exception in this respect. Under favourable conditions barley would be ready to feed from one month to six weeks after sowing. Sowing rates for green-feed barley range from 2 to 3 bushels per acre.

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DISEASES WHICH ATTACK BARLEY



[Green and Hahn]

An undamaged sample of grain is most important for malting. Left—A good sample. Right—A poor sample, showing grain damaged by faulty threshing.

Diseases

Diseases are not a serious aspect of barley growing at present. The most common diseases and their controls are listed here.

Covered Smut (*Ustilago hordei*)

Covered smut is no longer serious. In infected plants the normal grains are replaced by grains filled with a mass of black, evil-smelling spores. At threshing these diseased grains are fractured and the spores adhere to other, healthy grains. These remain on the seed and ultimately infect the growing plant and the developing grain. Control is achieved by treating seed barley with an organic mercurial seed dust at 2 oz per bushel. As practically all seed barley is now treated as a regular practice, excellent control has been achieved.

Loose Smut

(*Ustilago nuda*)

In the past loose smut has been responsible for very serious loss in barley crops.

Infected heads of barley are distinctively black and easily visible when the ears are freshly emerged. Later the spores are entirely dispersed by wind and rain and only the stalk remains. At this stage it is difficult to observe plants that have been infected. The spores are spread by the wind and infect the developing grain on neighbouring plants. These newly infected grains show no symptoms until resowing, when they give rise to infected plants.

Control of the disease is difficult, as the infection is carried within the seed and hot water treatment is neces-

sary to kill the organism. This treatment consists of presoaking the grain for five hours at 70 degrees F. followed by immersion in hot water at 127 degrees F for five minutes. The grain is then cooled off in cold water for a further five minutes and subsequently dried so that it is again able to be stored.

Most seed barley used at present originates from the Crop Research Division of the Department of Scientific and Industrial Research, where it is multiplied from single plant selections each year. During this process the seed is treated with hot water for two successive years, and this has proved a successful control.

Leaf Stripe (*Helmintiosporium gramineum*)

Leaf stripe is a seed-borne disease affecting plants in the seedling stage. Affected plants are either killed or damaged to the extent that they fail to produce grain. Diseased leaves

Features of Barley Growing in New Zealand

Area grown	.....	About 60,000 acres
Main growing district	.....	Canterbury
Most suitable soils	.....	Well drained loam of medium fertility, neutral or slightly alkaline
Varieties {		Research, Kenia
Malting	.....	Research, Kenia, Cape, Black Skinless
Feed grain	.....	Cape, Black Skinless, Wong
Green feed	.....	2 bushels per acre
Normal sowing rates {		1 cwt of superphosphate per acre
Seed	.....	Late August until mid October
Fertiliser		45 bushels per acre
Normal sowing period		50 lb
Average yield		
Commercial bushel weight		



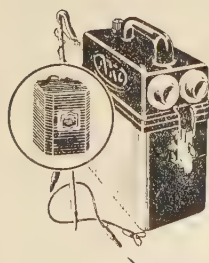
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Spraying could have saved this crop from infestation by Californian thistle.

produce spores which infect healthy grain. Symptoms are striping of the leaves and the development of blind heads. Control is obtained by dusting the seed with an organic mercurial dust at 2 oz per bushel. This is now standard practice with seed barley and the disease is no longer important.

Take All (*Ophiobolus graminis*)

Take all disease is caused by a soil organism which damages the roots and in some cases may kill the plants or cause them to die off before the ears are filled, giving the condition known as "white heads". Another symptom is the distinctive black at the base of the stem. The disease carries over in stubbles and in the roots of twitch, etc. Control is by crop rotation and the elimination of weed grasses such as twitch.

Scald (*Rhynchosporium secalis*)

Scald is characterised by water-soaked lesions on the infected leaves. These later become light grey with a dark-brown margin. Under wet conditions it can cause considerable damage to the crop. Alternate hosts are barley grass and goose grass. No control is known for this other than by destroying alternate hosts.

Eyespot (*Cerecospora herpotrichoides*)

Eyespot disease causes brown, oval lesions at the base of the stem which

cause weakening and lodging of the crop about the time of ear formation. It also results in "white heads" caused by the breaking of the straw in the early stages of development of the grain. Control is associated with crop rotation. Successive crops of either wheat or barley can result in a serious build-up of this disease and if trouble is experienced, an interval of about four years between grain crops is recommended.

Stem Rust (*Puccinia anomala*)

Stem rust can be quite serious in damp, humid seasons. It appears as rust-coloured pustules on the stem of the plant. These produce spores which are wind borne to infect other plants. No control is known for this disease.

Mildew (*Erysiphe graminis*)

Mildew usually affects thick, rank crops, particularly in dry seasons, and can seriously reduce the yield. The disease produces a grey mould over the leaf and stem which reduces the vigour of the plant. No control is practicable.

Pests

Hessian Fly (*Mayetiola destructor*)

Hessian fly lays its eggs on the leaves of the growing plants. When

the maggots hatch out they travel down the leaf and work their way along between the leaf sheath and the stem. When they reach a node they change into pupae which are the familiar "flax seeds" usually associated with this insect. Infestation causes weakening of the stems and their subsequent breaking off in strong winds. The insect overwinters in the pupal form on stubbles, straw, etc., and control is by the destruction of crop residues which are likely to be harbouring pupae.

Army Worm and Cut Worm

Army and cut worm caterpillars, the larvae of noctuid moth species including *Pseudaletia separata* and *Persectania ewingi*, can cause considerable damage to barley crops. With aerial spraying it is possible to spray at any period without damage to the crop. Dieldrin at 1½ pints per acre and DDT 20 per cent emulsion at ½ gallon per acre give satisfactory control.

Acknowledgment

With the exception of the illustration on page 69 acknowledgment for illustrations is made to Canterbury (N.Z.) Malting Co., Canterbury (N.Z.) Seed Co., and Canterbury Agricultural College.

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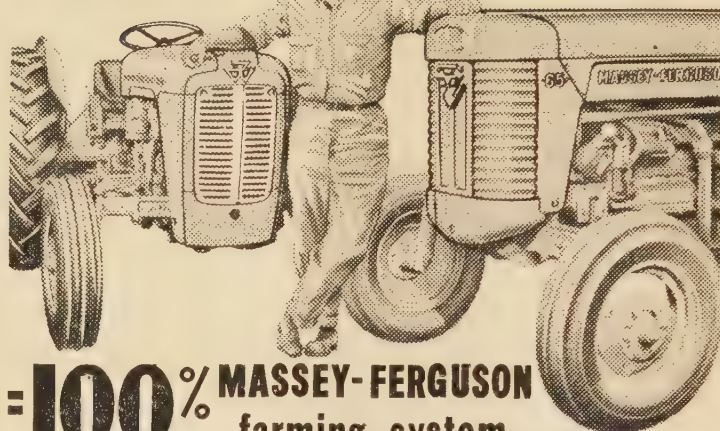
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Citrus Orchard Nutrition and Soil Management

By W. A. FLETCHER,
Citriculturist, Department of Agriculture, Auckland

THE first section of this article, published last month, discussed the major mineral elements which citrus trees require for growth. This concluding section describes the minor or trace mineral elements needed in the soil and deals with the use of mixed fertilisers, the use of lime, and the role of organic matter in the maintenance of soil fertility.

TRACE ELEMENT NUTRITION

OF the trace elements known to be essential for plant growth only manganese and zinc have been observed to be deficient in citrus trees in New Zealand.

Iron

Iron is necessary for the formation of chlorophyll and a deficiency exhibits itself as a characteristic chlorosis in which the network of veins is traced out in green on a lighter background. Though similar symptoms to these have been seen in New Zealand, no responses were obtained with soil dressings or foliar sprays of chelated iron compounds. Further tests with manganese sulphate sprays showed that the symptoms were early expressions of manganese deficiency. There has been no definite evidence yet of iron deficiency with citrus trees in New Zealand and it is unlikely ever to be a serious problem.

Copper

Copper deficiency occurs in citrus in Australia and other countries, but it is most unlikely to appear in citrus orchards in this country while bordeaux or other copper sprays for disease control are regularly used. Control of copper deficiency overseas is achieved by applying copper sulphate sprays.

Boron and Molybdenum

Deficiencies of boron and molybdenum also occur on citrus trees overseas, but though these elements have been found to be deficient for other crops in some New Zealand soils, no symptoms of deficiency have been seen in citrus, nor have any visible responses been obtained from foliar sprays and soil dressings of these nutrients.

Manganese

Symptoms of manganese deficiency are common in citrus in all districts in New Zealand on acid and alkaline soils. There is evidence that excessive liming has caused severe defi-

ciency in some orchards and naturally high pH's of some Gisborne soils have also induced deficiency. Deficiency on acid soils at Kerikeri and Auckland may be due to soil depletion from leaching. However, in both soil and solution culture experiments with citrus trees Professor H. D. Chapman of the Citrus Experiment Station, Riverside, California, has recorded secondary typical manganese deficiency patterns on leaves of trees lacking phosphate. The mechanism of this effect is unknown, but it could well be a contributing cause in manganese deficiency in some citrus orchards in New Zealand.

Deficiency Symptoms

The main symptom is leaf chlorosis. On young leaves the deficiency first appears as a fine pattern of green veins on a lighter green background. This

expression is commonly seen on lemon trees. When leaves are fully grown the pattern becomes more distinct. A band of green tissue remains along the midrib and main veins and the areas between the veins and along the leaf margin become pale green or yellowish.

Examples of severe deficiency have been seen where the leaves were almost completely devoid of green. The shape and size of the leaves remain more or less normal.

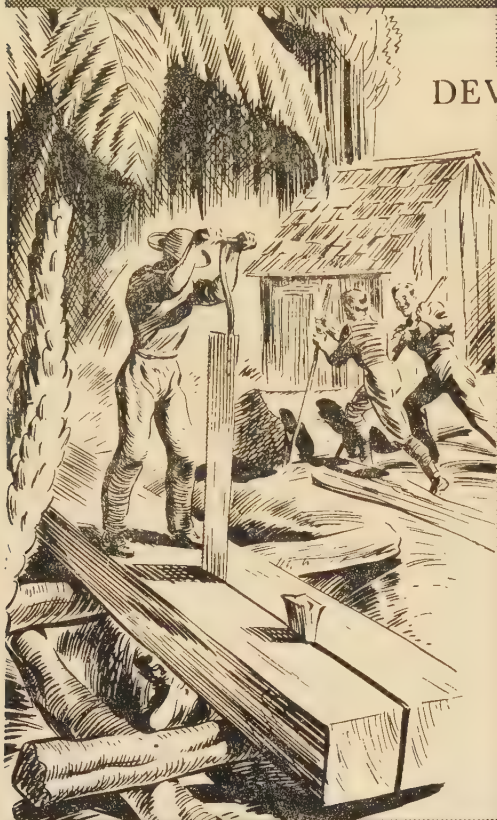
Fortunately manganese deficiency in New Zealand is seldom so acute as to affect citrus tree growth seriously and no measure of the effect of remedial treatment on fruit yields and quality has yet been made here. Nevertheless, treatment should be beneficial and is recommended.

Treatment

Treatment for manganese deficiency is by a foliar spray of manganese sulphate made up by mixing 6 lb of manganese sulphate with 8 lb of hydrated lime in 100 gallons of water, the same procedure as in preparing bordeaux mixture being followed. The spray can be mixed with other trace element or therapeutant sprays such as bordeaux mixture and oil. If it is combined with bordeaux extra lime is not required.



A well maintained New Zealand grapefruit orchard in permanent sward. There is an increasing trend among citrus growers to adopt this system of soil management in their orchards.



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Manganese sprays with lime should not be applied to trees with maturing fruits nearing harvest, as they leave a very dark deposit which is not readily removed from the fruit.

To avoid this deposit the spray can be applied without lime but with the use of a spreader. It has been found, however, that this spray is generally not as effective as one with lime, probably because rain removes the spray from the leaves before sufficient manganese has been absorbed. Two separate sprays at half strength may be more effective than a single full-strength spray without lime.

Manganese sprays need not be applied as thoroughly as therapeutant sprays; a reasonably good wetting of the periphery of the tree is sufficient.

For best results sprays should be applied any time between September and November, but, being evergreen trees, citrus will probably benefit from sprays applied at any time during the growing season.

In orchards where the soil is alkaline consideration should be given to cultural methods that are likely to lower the pH, such as use of sulphate of ammonia fertiliser. Overliming in any orchard should be avoided.

Zinc

Definite evidence of zinc deficiency in citrus has been obtained only at Kerikeri. Fortunately its occurrence is not as severe as it frequently is on citrus overseas, but it is probable that many orchards would benefit from treatment.

Deficiency Symptoms

Symptoms of zinc deficiency are a leaf chlorosis which in mild cases is difficult to distinguish from manganese deficiency, but normally the areas between the veins and along the leaf margins are more distinctly yellow than they are with manganese deficiency. In more acute cases leaves are small, pointed, and abnormally narrow and may occur in rosettes, because shoots do not make normal growth.

Symptoms of zinc deficiency and manganese deficiency are sometimes found in combination at Kerikeri. If, after spraying with manganese, chlorotic leaves are still evident, this suggests that a zinc spray should also be applied.

Treatment

Treatment of zinc deficiency is also by a foliar spray. Six pounds of zinc sulphate is mixed with 8 lb of hydrated lime in 100 gallons of water in a similar manner as for bordeaux mixture. This spray can be mixed with manganese sulphate and bordeaux sprays when only one lot of lime is necessary. Residues from zinc sulphate sprays are of no concern and timing of sprays is the same as for manganese treatments.



Chlorosis of New Zealand grapefruit leaves indicating a manganese deficiency. A healthy leaf is on the left.

USE OF MIXED FERTILISERS

Several proprietary fertiliser mixtures containing nitrogen, phosphorus, and potassium are available and because they are convenient to apply are frequently used by citrus growers. It is considered, however, that more efficient use of fertilisers can be achieved if they are applied separately. For example, mixtures may contain considerably more or less of a nutrient than is desirable for the trees' requirements.

Another example is in timing applications. Phosphatic fertilisers are probably most efficiently used if they are applied in autumn when a cover crop is sown, but in a mixed fertiliser most of it would be applied in spring, when the nitrogen component is required by the trees.

An effective and economical formula which can be recommended to growers who wish to make up their own citrus mixture is: Sulphate of ammonia 45 per cent, serpentine superphosphate 45 per cent, and sulphate of potash 10 per cent.

Percentages of nitrogen, phosphoric acid, and potash in this mixture are approximately 9:7:5. About 3 per cent of magnesium oxide is also provided. To apply 1 lb of nitrogen to a tree would therefore require about 11 lb of this mixture.

The mixture would have an acidifying effect on the soil, but this could be corrected by applying carbonate of lime at 7½ lb for every 10 lb of mixture used.

A proprietary fertiliser widely used by orchardists has the following composition: Sulphate of ammonia 10 per cent, serpentine superphosphate 35 per cent, muriate of potash 10 per cent, blood and bone 35 per cent, and dried blood 10 per cent.

Percentages of nitrogen, phosphoric acid, and potash in this mixture are approximately 6:10:6.

This mixture is a good fertiliser, but the proportion of nitrogen compared with phosphorus and potash is considered to be insufficient for citrus, and use of the mixture should be supplemented with dressings of sulphate of ammonia at 2 to 3 lb of sulphate of ammonia for every 10 lb of mixture used. It requires about 16 lb of the mixture to apply 1 lb of nitrogen. Two and half pounds of sulphate of ammonia provides ½ lb of nitrogen.

As a general guide mixed fertilisers are probably best applied in two dressings each year, about two-thirds in August and the remainder in February.

The rate of application of mixed fertilisers should be dictated by the amount of nitrogen applied.

Fertilising Young Trees

For at least the first five years after planting emphasis should be on making strong tree growth. Mixed fertilisers rich in nitrogen are suitable for this purpose. In the first two or three years after planting, while the trees' root areas are small, fertilisers will be more effective if applied in four or

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five or more dressings during growing periods each year. As the trees get older the number of dressings can be reduced to two or three per year.

Newly planted trees should receive about a pound of mixed fertiliser in the first year. This amount should be increased each year according to the variety and its vigour until amounts recommended for bearing trees are being applied.

Placement of Fertilisers

To be efficient fertilisers must be applied to the rooting area of the trees. With large, healthy trees this means spreading the fertiliser evenly over the whole orchard area. With small or unthrifty trees it requires to be spread evenly in a zone extending about 1 ft from the trunk to 1 to 3 ft beyond the spread of the branches.

USE OF LIME AND pH CONTROL

The lime requirement of a soil is judged on its relative acidity or alkalinity as shown on a pH scale. A pH of 7 indicates a soil with a neutral reaction; a higher figure indicates an alkaline reaction, and a lower figure an acid reaction.

Citrus, in common with many other plants, is considered to grow best on soils ranging from pH 5.7 to 6.5, but some good orchards are established at Gisborne on soils with a higher pH than this.

The commercial citrus growing districts of New Zealand are all high-rainfall areas and, with the exception of Gisborne, virgin soils, especially at Kerikeri and Auckland, are often very acid. For this reason orchards generally benefit from an initial application of 1½ to 2 tons of carbonate of lime per acre and thereafter require the equivalent of annual dressings of 10 to 15 cwt per acre. When magnesium deficiency is a problem dolomite or magnesite can be substituted for ordinary carbonate of lime.

The amount of liming materials which must be applied also depends on the amount of acid-forming fertilisers used in an orchard. For example, it requires 1½ cwt of lime applied separately to neutralise the effect of applying 1 cwt of sulphate of ammonia.

The important effect of liming in relation to phosphorus, magnesium, and trace element availability was mentioned in the preceding section of this article.

The best method of applying lime, especially at Kerikeri, is to combine it with superphosphate and broadcast it when sowing a cover crop.

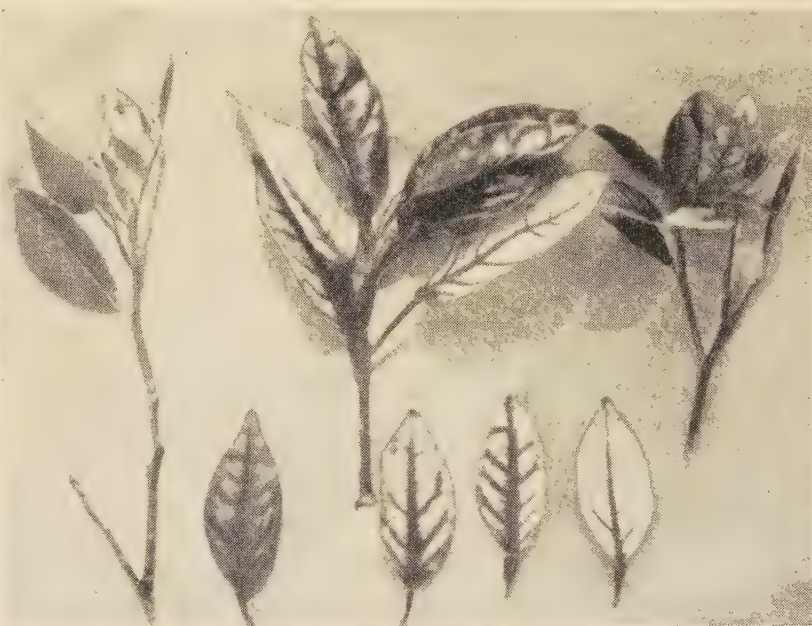
Lime must be applied no earlier than about three or four weeks before or after applying sulphate of ammonia; otherwise free ammonia gas will be released and lost to the air.

CITRUS ORCHARD NUTRITION



Chlorosis of leaves of Mediterranean sweet orange at Kerikeri caused by zinc deficiency.

▼ Severe symptoms of zinc deficiency on sweet orange foliage in the Cook Islands. Beside the chlorosis of the leaves is a "little leaf" and rosette condition.



ROLE OF ORGANIC MATTER

Though organic matter in itself is not essential for plant growth, it plays an important role in maintaining soil fertility and has many indirect benefits in plant nutrition.

It improves soil structure and aids in soil aeration, improves water infiltration and reduces erosion, and may increase the water-holding capacity of some soils. It is needed for the growth of soil organisms that help make mineral elements available to the

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trees, and it serves as a storehouse of plant nutrients, especially nitrogen. The colloidal action of humus may improve the base-exchange capacity of a soil and help reduce leaching losses of nutrients.

Organic matter in the soil is derived from dead leaves, twigs, and fruits from the trees, from weeds or cover crops, and from any animal manures or vegetable mulch that may be applied in the orchard. This organic matter is continually being lost by decomposition and its regular replacement is important in successful soil management.

Systems of soil management used in New Zealand citrus orchards are winter cover crops and summer cultivation and permanent sward and mowing. Mulching in combination with each of these systems is also often practised.

COVER CROPS AND CULTIVATION

This system is widely used in New Zealand and has proved to be practical and economical in all the citrus districts. Cover crops provide organic matter to maintain good soil structure and help prevent development of cultivation hard pans.

The cover crop, which is usually sown in February-March, should be quick growing so that a maximum amount of plant material can be turned into the soil. The most popular crops are blue lupins, Algerian oats, a combination of the two, or mustard.



All cultivation in a citrus orchard must be shallow to avoid damage to tree roots and should be only sufficient to kill weed growth and yet leave it lying on the surface to continue to protect the soil.

CITRUS ORCHARD NUTRITION



A cover crop of blue lupins in an orange orchard. Cover crops provide organic matter to maintain good soil structure and help prevent development of cultivation hard pans.

More frequently growers simply cease cultivations in late summer and allow a natural growth of winter weeds to develop. In most orchards a satisfactory bulk of organic matter can be obtained in this way with much less trouble and at substantially lower cost.

Whether a cover crop is sown or weeds are allowed to develop, it is good practice to stimulate their growth

in early autumn by applying 3 to 6 cwt of superphosphate per acre together with any lime required by the orchard. This may also assist in making phosphorus more available and help distribute it at the rooting depth of the trees.

If the cover crop is allowed to grow unchecked beyond the beginning of September, it will seriously compete with the trees for nitrogen during the spring growth flush. Turning the crop into the soil at this stage, however, exposes most orchards to serious soil erosion during heavy spring rains. To overcome this danger and yet avoid excessive competition for the trees it is better to check the cover crop by mowing or by lightly discing one way across the slope without turning the soil.

The only useful purpose of cultivation in a citrus orchard is to control cover crop and weed growth and if necessary to prepare a seedbed for a cover crop. Cultivation tends to decrease the organic matter in the soil and if carried to excess can be very harmful to soil structure.

The number of cultivations should be kept to the minimum necessary to prevent competition from ground growth. Perfectly clean cultivation in summer is not necessary or desirable. In fact, provided weeds are not growing strongly, the more cover left on the surface the better.

All cultivation must be shallow to avoid damaging tree roots and should be only sufficient to kill weed growth and yet leave it lying on the surface to continue to protect the soil.

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GRASSING DOWN IN THE ORCHARD

There is an increasing trend among citrus growers to sow their orchards down in permanent swards, which are controlled by mowing. Orchards in the Bay of Plenty have been grown successfully in grass for many years, but generally a hand-cultivated square was maintained round each tree and kept mulched with grass clippings or material brought from outside the orchard. The present-day trend is to grow the sward right up to the trees.

Advantages of this system of soil management are pleasant conditions for spraying and harvesting, control of erosion, a steady build-up of organic matter in the soil with all its advantages, and a decrease in tree root damage due to cultivation, which may also reduce the danger of *Phytophthora* root rot infection.

The main disadvantage of grassing down is competition for water and nutrients by the sward.

New Zealand experience with grassing down in citrus orchards has been variable. Where there has been good management vigorous varieties such as lemons and grapefruit have been grown successfully under this system, but experience with slower-growing varieties such as oranges on trifoliata rootstocks has not always been satisfactory, especially when the sward has been laid down while the trees are young. In these cases it would be wiser to wait until the trees are at least seven or eight years old before attempting to lay down a sward.

There is very little information about the most suitable seed mixtures to use in laying down a sward. Many growers have simply ceased cultivation after levelling the soil and have allowed a volunteer growth to develop. Provided no bad weeds such as couch grasses are present, there is no evidence that this method is any less satisfactory than sowing a special mixture. Indeed, broad-leaved weeds have a much lower demand for nutrients than grasses and require less cutting.

Many growers, however, prefer to establish a sward which consists largely of clovers, and there is some merit in this because of the nitrogen they supply. It is not possible at this stage to recommend any one particular seed mixture in preference to another, but the following mixture has been found to give a good grass-clover sward in many orchards:

	Lb per acre
Perennial ryegrass	5
Short-rotation ryegrass (H1)	5
White clover	5
	—
	15
	—

CITRUS ORCHARD NUTRITION



Mulching in a lemon orchard. In this orchard mulching is combined with grassing down. Waste hay has been spread in strips along the tree rows while permanent sward is maintained between the rows.

Citrus growers should be cautious about grassing down their orchards. Adequate water from rainfall or irrigation to meet the demand of trees and sward must be available and additional fertiliser will also be required, especially for the first few years. The sward must be mown regularly and kept short during the dry months.

When orchards are grassed down spectacular improvement cannot be expected immediately. Instead there may be an initial check on tree growth. Under correct management, however, there is evidence that trees recover and improve within a few years.

MULCHING

As a means of conserving moisture and increasing humus, mulching around citrus trees has been common in New Zealand orchards for many years. Mulches also supply some nutrients. Practices vary, but the most common method is to build a layer of mulch from 6 to 12 in. deep from near the trunk to beyond the spread of the branches. Care must be taken, however, to keep the material clear of the trunk, for if it is placed too close, it may create conditions favourable for the development of serious bark diseases.

Waste hay, straw, etc., are good mulching materials if they can be transported to the orchard cheaply enough. In the Gisborne district several growers have been able to

collect pea and sweet corn refuse from a canning factory for mulching.

INTERCROPPING YOUNG ORCHARDS

For the first four or five years vegetable crops may be grown between the rows of trees. They should not be planted so close to the trees as to interfere with their roots, and fertiliser for the crops should be applied in addition to the trees' requirements.

Potatoes, kumaras, tomatoes, peas, beans, lettuce, and other summer crops are suitable, but they should not be allowed to interfere with winter cover cropping in the orchard. Sowing maize between young trees, as is sometimes practised at Gisborne, is not recommended, as this crop competes severely with the trees.

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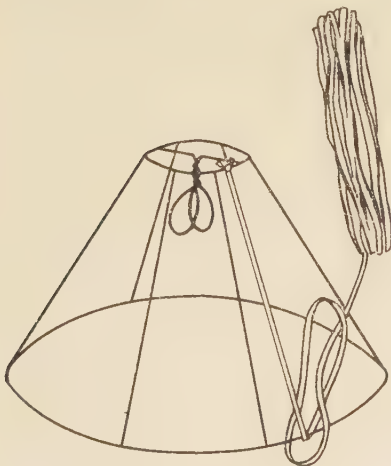
Make a Bedside Lamp

By JANET W. ROBERTS,

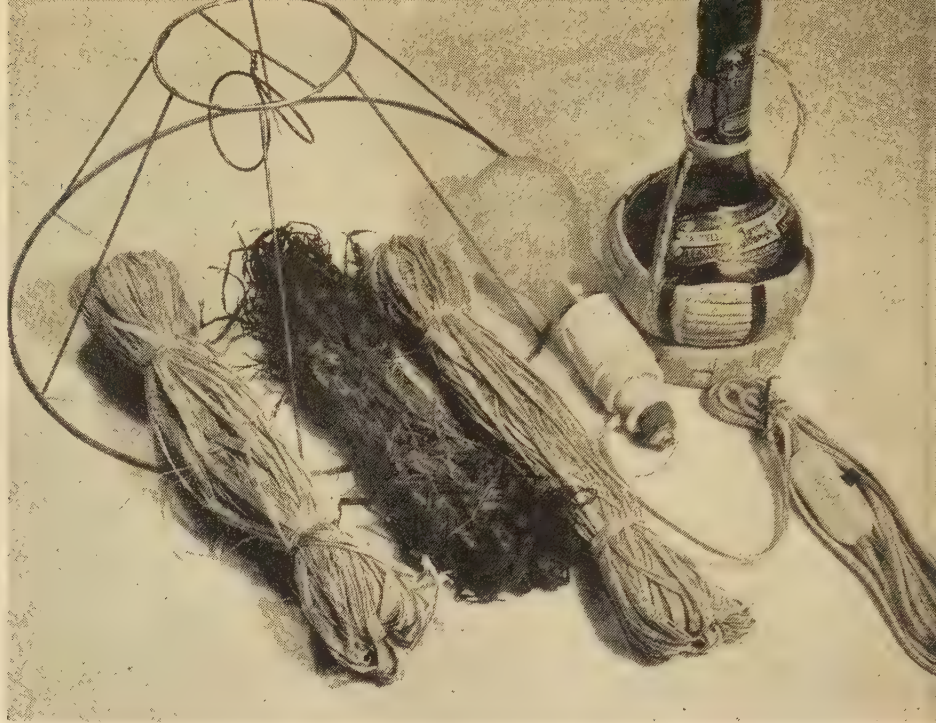
Home Science Instructor,
Department of Agriculture,
Auckland

DO you like to read in bed? Don't ruin your eyesight; make a bedside lamp. It will add charm to your room as well as provide localised light for reading.

LAMPS are a conspicuous accessory in a room, so they should be simple in shape and design and well proportioned. The illustration shows the necessary materials for making an unusual and attractive lamp for less than the price of one bought ready made: A wine bottle, an electrical fitting into which the light bulb is inserted, a wire frame with a "butterfly" type of bulb holder, and some raffia.



Method of winding raffia on frame.



Materials for making the lamp stand and shade.

Choice of Materials

For the base of the lamp any type of bottle with a narrow neck and sturdy base, such as the Italian wine bottle in the illustration, is suitable. A similar-shaped ornament, such as a vase with an opening measuring approximately an inch in diameter, could be used to hold the electrical fitting. Good proportion between the base and the shade is hard to obtain if a very long-necked bottle is used.

There is less likelihood of tipping the lamp by accidentally catching the cord if the flex is carried through the bottle and out through a hole in the side, near the bottom. This hole would have to be bored by a glazier. Otherwise a fitting with the flex coming from the side at the top of the bottle will be needed, and it is then wise to fill the bottle with sand, thus adding weight to the lamp base.

The electrical fitting may be bought complete with lamp holder, switch, and flex, and some shops that sell electrical equipment will set the fitting into the bottle. A bedside lamp should be approximately 60 watts.

There is a variety of wire frames suitable for lamp shades. Do not buy one which is intended for a hanging light bulb. The shape and size of the shade will be influenced by the proportions of the stand. The recommended height for table lamps is 20 to 30 in., but bedroom lamps may be only 12 in. high.

For a raffia lamp shade the frame should have at least four side-supporting struts. The shade must be

deep enough to cover the bulb to avoid glare, as the eye should never be exposed to direct light, yet the shade should be wide and flaring enough to give adequate light.

When deciding on the colour of the raffia consider the colours in the room where the lamp is to be used. The colour of the lamp should tone with the room colourings both in daylight and in artificial light. Consider also whether or not the colour will diffuse or restrict the light. Light colours reflect the light; dark colours absorb it. Stripes of different shades of raffia will give an interesting effect. Dark-coloured lamps are useful for decorative purposes.

Beside the ordinary raffia, plastic raffia can be bought and though it is a little more expensive, it is washable and there is no waste as with a hank of ordinary raffia.

Construction

Dampen the raffia to give it greater flexibility so that it can be pulled tautly over the frame.

Start by tying the raffia to the top rim and then bring it down the outside of the frame.

Bring it up in a loop inside the frame, push the hank of raffia through the loop from the outside, and pull tightly.

Continue all round the frame, spacing the loops evenly.

Set the shade on to the bulb, which is in the socket of the fitting at the top of the bottle, and the lamp is complete.

Keeping the Tins Full

By JUDITH FERRIER,
Home Science Instructor, Department of Agriculture, Christchurch

IN many homes the biscuit tins are filled and emptied again fairly rapidly with the help of the younger members of the family, to whom "just one" seems to mean just one pocket or even tin full if mum isn't there to keep a strict eye on them. Even the figure-conscious find it hard to resist the old favourites and can easily persuade themselves that they should try the new kinds, just to see how they compare. The result is that empty tins confront the housewife when unexpected guests appear unless she has a good hiding place for keeping at least one tin to cope with such emergencies.

MAKING biscuits is easier for the housewife if she has mixing bowls of various sizes, a wooden spoon, rubber scraper, a wide spatula or fish slice, and a wire cooling rack on which the wires are not too widely spaced.

Special equipment such as a biscuit forcer and fancy cutters are not essential, but a set of plain cutters or sharp edged tins in different sizes is a help.

Oven trays which are 2 to 3 in. smaller than the oven all round allow the air to circulate freely over the biscuits so that they are browned evenly. If the hot air cannot circulate, it tends to collect under the tray and the biscuits become burnt or too brown underneath. The trays should not be washed between batches of one baking but wiped clean with absorbent paper.

Care with Ingredients

Ingredients should be fresh and of the best quality available.

Care should be taken with **nuts**, which go rancid easily, especially if they have been shelled for some time. Almonds should be blanched not more than $\frac{1}{2}$ lb at a time. Cover the nuts with boiling water, leave a few moments, and then slip off the skin by pressing the nut between the finger and thumb. Drop them into cold water to prevent discolouration and dry them thoroughly before using or storing.



[Green and Hahn]
Using a biscuit forcer. The cheese straw mixture is put through the forcer to form straws and rings. Various plates can be used in the forcer to produce differently shaped sweet or savoury biscuits. The dough used must be rich and plastic, yet firm enough to hold its shape on the tray.

Dried fruits can be cut easily with wet scissors. For grated **lemon** or **orange rind** use only the very outside, coloured portion of the skin.

Spices are best sifted together with the dry ingredients, and **essences** give the most satisfactory results if they are added to the fat in the mixture. When the butter and sugar are being creamed is an ideal time, as the flavour is then evenly and thoroughly distributed. For a coffee flavour, essence or powdered instant coffee is preferable to strong coffee made from grounds, as the latter does not seem to impart a very definite coffee flavour to the finished product.

Butter should not be allowed to become oily or be melted before being used unless melted shortening is specifically directed in the recipe.

Brown sugar should be measured packed firmly into the measuring cup. **White sugar** and **flour** (after sifting) should be spooned in lightly to the required level and not shaken down.

The liquid used can be **milk**, which gives a richer mixture, or **water**. Water-made biscuits have better keeping qualities than those made with milk, and, if desired, the water may be replaced, all or in part, by fruit juice to give additional flavour and interest.

To save washing up, measure dry ingredients before fats and fats before syrups. **Syrup** can be more accurately measured in a greased utensil. Solid **fats** can be weighed on to waxed paper, measured by water displacement (see June 1958 "Journal" p. 622) or, if melted shortening is required, melted first and then measured.

Mixtures which contain a fair amount of fat can be put on to ungreased trays, but if there is doubt, grease the tray lightly to see how the first batch turns out.

The richer mixtures generally require a slow oven. Biscuits containing **honey** need very careful watching, as they burn easily.



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Most biscuits are better if they are allowed to cool and to firm up slightly on the oven tray before they are transferred to the wire cooling rack.

Storage

Because crisp biscuits absorb moisture from the air and moist biscuits tend to dry out, separate airtight containers are essential for the storage of both types. If crisp biscuits have become soft, they may be re-crisped by putting them in a moderate oven for several minutes and cooling them before they are served.

RECIPES

In these recipes level measures using the standard measuring cup (8 fl. oz.) and spoons have been used.

Bran Biscuits

3 oz of butter	2 oz of bran (1 cup)
3 oz of sugar	4 oz of sifted flour
1 egg	1 teaspoon of baking powder
1 teaspoon of salt	

Cream the butter and sugar until light and fluffy. Beat in the egg. Sift the flour, baking powder, and salt and mix with the bran. Blend the dry ingredients into the creamed mixture. Roll out thinly on to a board sprinkled with bran. Cut into neat squares or rounds and bake at 350 degrees F for 15 to 20 minutes.

Cheese Straws and Busters

8 oz of flour	4 oz of grated cheese
1 teaspoon of salt	2 egg yolks
$\frac{1}{2}$ teaspoon of dry mustard	4 tablespoons of water
4 oz of butter	1 teaspoon of lemon juice
Few grains of cayenne pepper	

Sift the dry ingredients together. Rub in the butter. Stir in the cheese. Beat the egg yolks with the lemon juice and water. Stir sufficient into the dry ingredients to make a soft consistency. Pipe through a biscuit former into straws and rings.

Alternatively, add slightly less liquid to obtain a stiffer dough. Roll out thinly, prick well, and cut into neat squares.

Bake at 350 degrees F for 10 to 12 minutes.

Cocktail Chips

6 oz of sifted flour	2 oz of butter
1 egg	$\frac{1}{2}$ teaspoon of baking powder
$1\frac{1}{2}$ cups of finely chopped or minced walnuts or almonds	1 teaspoon of salt
6 oz of grated cheese	Pepper to taste

Rub the butter into the flour. Add the remaining ingredients except the egg and mix thoroughly. Add the beaten egg, mix to bind, and roll out thinly. (It may be necessary to add a little milk if the dough is too dry to roll out.)

Cut into $1\frac{1}{2}$ in. squares. Bake at 400 degrees F until slightly browned.

Curry Crackers

$1\frac{1}{2}$ oz of lard	4 oz of cold water
$1\frac{1}{2}$ oz of butter	2 teaspoons of onion salt
9 oz of flour	$\frac{1}{2}$ teaspoon of salt
$2\frac{3}{4}$ teaspoons of curry powder	Salt for sprinkling



Though fancy cutters are not essential in biscuit making, a set of plain cutters is a help.

[Sparrow

Melt the butter and lard over a low heat. Blend in 3 oz of flour and remove from the heat. Add cold water, mix well, return to the heat, and stir until the mixture leaves the sides and bottom of the pan.

Sift together 6 oz of flour, the curry powder, and the salt. Add to the cooked mixture, knead in thoroughly, and turn out on to a well floured board.

Roll out to $\frac{1}{8}$ in. thick and cut into 2 in. squares. Place on a baking tray, prick with a fork, and sprinkle liberally with salt.

Bake at 425 degrees F for a few minutes until they begin to brown.

Clifford Tea Biscuits

4 oz of butter	$\frac{1}{2}$ cup of chopped nuts
1 tablespoon of golden syrup	4 oz of sifted flour
1 teaspoon of baking soda	6 oz of sugar
1 tablespoon of boiling water	$2\frac{1}{2}$ oz of coconut (1 cup)
	3 oz of rolled oats (1 cup)

Combine the butter and syrup, warming to melt. Mix together the flour, sugar, coconut, rolled oats, and nuts. Stir in the butter mixture. Dissolve the soda in water, add to the other ingredients, mixing well.

Place spoonfuls on a greased tray, and press with a fork. Bake at 350 degrees F for 20 minutes.

The coconut may be replaced by crushed cornflakes.

Hokey Pokey Biscuits

4 oz of butter	1 tablespoon of golden syrup
4 oz of sugar	1 tablespoon of milk
6 oz of flour	
1 teaspoon of baking soda	

Cream the butter and sugar. Put the syrup and milk in a saucepan and heat slowly so that the syrup is dissolved. Add the soda and combine the frothy mixture with the creamed mixture. Fold in the flour.

Place teaspoonfuls on a cold tray. Allow for spreading. Bake at 300 to 325 degrees F for about 30 minutes.

Ginger Jimmies

4 oz of butter	8 oz of flour
5 oz of brown sugar	1 teaspoon of baking soda
2 dessertspoons of golden syrup	1 teaspoon of ground ginger
1 cup of chopped crystallised ginger	$\frac{1}{2}$ teaspoon of salt

Cream the butter, sugar, and syrup. Add the ginger roughly chopped. Sift the dry ingredients and stir into the creamed mixture. Knead lightly, just until smooth and well mixed.

Place teaspoonfuls on a lightly greased tray. Press with a floured fork and pinch any cracked edges together. Bake at 425 degrees F for 10 minutes.

Peanut Daisies

7 oz of self-raising flour	Skinned, halved peanuts
$\frac{1}{2}$ teaspoon of salt	6 oz of brown sugar
1 tablespoon of cocoa	1 egg
	4 oz of butter

Sift the flour, salt, and cocoa together. Put the sugar, egg, and half the flour mixture into a bowl. Melt the butter gently, add to these ingredients, and beat 2 minutes. Mix in the rest of the flour.

Shape into small balls and press 5 peanut halves on to each to represent the petals of a daisy. Bake at 400 degrees F for 15 minutes.



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Nut Brownies

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7 oz of flour
 $\frac{1}{2}$ teaspoon of baking powder
 $\frac{1}{2}$ teaspoon of baking soda
1 egg yolk
 $\frac{1}{2}$ teaspoon of salt
1 dessertspoon of cocoa
1 tablespoon of golden syrup

Cream the butter and sugar. Add the syrup, cocoa, and egg yolk, beating well. Sift the rest of the dry ingredients and stir into the creamed mixture.

Roll out $\frac{1}{8}$ to $\frac{1}{2}$ in. thick on grease-proof paper. Place on an oven tray and spread with meringue.

Meringue

1 egg white
 $\frac{1}{2}$ cup of chopped nuts
3 oz of brown sugar

Beat the egg white stiffly, gradually adding the sugar. Fold in the nuts.

Bake in a low part of the oven at 350 degrees F for 30 minutes.

Peanut Shortbread

Base

12 oz of butter
4 oz of peanut butter
4 oz of castor sugar
14 oz of flour

Knead the ingredients together until very smooth. Press out $\frac{1}{8}$ in. thick in a shallow tin.

Topping

2 oz of butter
2 oz of castor sugar
3 oz of finely chopped, skinned peanuts
2 oz of flour

Cream the butter and sugar and add the finely chopped, skinned nuts and the flour. Spread on to the shortbread and lightly press into the surface.

Mark the shortbread into sections and bake in a hot oven for about 30 minutes or until a pale brown.

Half this quantity will fill one sponge roll tin.

Peanut Whirls

4 oz of plain flour
1 egg
4 oz of self-raising flour
or 8 oz of plain flour and $\frac{1}{2}$ teaspoon of baking powder
4 oz of butter
3 oz of brown sugar
 $\frac{1}{2}$ teaspoon of salt
2 tablespoons of milk
1 tablespoon of peanut butter
4 oz of dates
2 tablespoons of orange juice
 $\frac{1}{2}$ teaspoon of grated orange rind

Place the chopped dates, orange juice, and rind in a saucepan and stir over a low heat until the dates are soft. Beat in the peanut butter and allow to cool.

Cream the butter and sugar. Add the beaten egg and the milk. Sift the dry ingredients into this mixture and blend to a dry dough.

Roll out into an oblong about $\frac{1}{8}$ in. thick. Spread this to within $\frac{1}{2}$ in. of the edges with the cooled date mixture. Roll from the sides to form a long roll. Chill until cold and firm and slice into $\frac{1}{4}$ in. slices. Bake at 350 degrees F for 10 to 12 minutes.

This recipe may be used unchilled and sliced $\frac{1}{2}$ in. thick. Bake slightly longer until golden, and the result will be more like a small cake than a biscuit.

Peanut Crunch

5 oz of butter
4 oz of sifted flour
 $3\frac{1}{2}$ oz of sugar
1 teaspoon of baking powder
1 cup of coconut
 $\frac{1}{2}$ cup of chopped, skinned peanuts
1 tablespoon of golden syrup
1 cup of cornflakes

Cream the butter, sugar, and syrup until light. Sift the flour and baking powder and mix with the roughly crushed cornflakes. Add to the creamed mixture and press into a flat tin or on to an oven tray.

KEEPING THE TINS FULL

Bake at 350 degrees F for 30 minutes. Ice and cut into squares while hot.

Icing
2 oz of butter
 $4\frac{1}{2}$ oz of sifted icing sugar
1 tablespoon of golden syrup
Melt together.

Chew Bars

4 oz of butter
8 oz of brown sugar
2 eggs
6 oz of sifted flour
2 teaspoons of baking powder
 $\frac{1}{2}$ teaspoon of salt
 $\frac{1}{2}$ teaspoon of vanilla essence
 $\frac{1}{2}$ cup of coconut
 $\frac{1}{2}$ cup of chopped walnuts
 $\frac{1}{2}$ cup of chopped ginger

Cream the butter and sugar with the vanilla. Add the eggs and beat in well. Stir in the chopped walnuts and ginger and coconut. Sift the dry ingredients into this mixture. Turn into a lightly greased sponge roll tin and if desired spread with the following topping:

$\frac{1}{2}$ cup of coconut
2 teaspoons of ground ginger
 $\frac{1}{2}$ cup of brown sugar

Mix together and pat lightly into the surface of the other mixture.

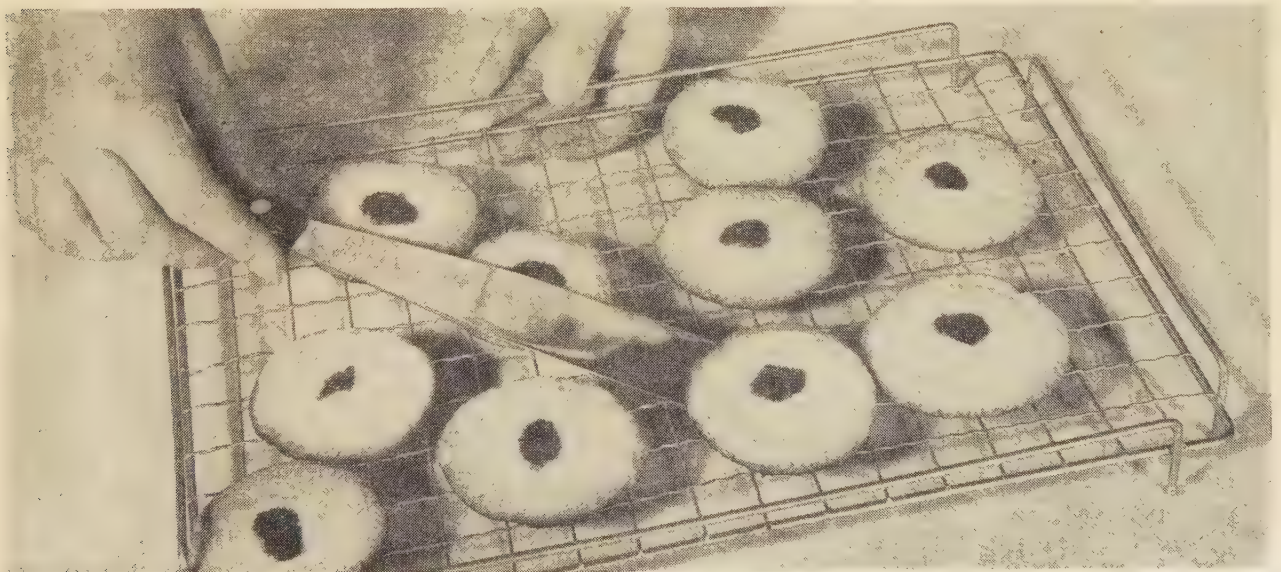
Bake the whole mixture for 45 minutes at 350 degrees F. Cut into fingers while hot, but allow to cool in the tin.

Caramel Slice

4 oz of butter
7 oz of brown sugar
1 egg
4 oz of sifted flour
1 teaspoon of baking powder
3 oz of chopped walnuts
4 oz of stoned and chopped dates

Mix the dates and walnuts. Sift the flour and baking powder. Melt the butter and add the sugar and beaten egg. Blend in the flour mixture and then the nuts and dates.

Bake at 350 degrees F for 20 minutes in a shallow tin. Cut into fingers.



The wires on the cooling rack should not be too widely spaced.

KEEPING THE TINS FULL . . .

Lemon Shortbread

4½ oz of sifted icing sugar
8 oz of butter
7 oz of sifted flour
4 tablespoons of cornflour
½ teaspoon of salt
2 teaspoons of grated lemon rind
1 teaspoon of lemon juice
½ teaspoon of vanilla

Cream the butter and sugar until light. Stir in the lemon rind, juice, and vanilla. Sift the dry ingredients, and beat into the creamed mixture.

Press into a square tin 9 in. x 9 in. x 2 in. or press out ½ in. thick on to the oven tray. Prick, and decorate with citrus peel if desired.

Bake at 350 degrees F until a pale gold in about 20 to 30 minutes. Cut into squares while hot.

Cherry Square

4 oz of butter
4 oz of sifted flour
24 glace cherries
1½ teaspoons of almond essence
2 egg whites
1 cup of brown sugar
¼ teaspoon of baking powder

Cream the butter with ½ teaspoon of almond essence until soft. Add the flour and blend in to form a soft paste. Roll or press out into a large square or oblong about ¼ in. thick. Cut the cherries into three or four pieces and press into the surface of the pastry.

Beat the egg whites stiffly. Gradually add the brown sugar, beating all the time to form a meringue. Beat in the rest of the almond essence and the baking powder and spread the meringue evenly over the cherries.

Bake at 325 degrees F for 30 to 40 minutes until a light golden brown. Cut into pieces while still warm.

Ginger Slice

14 oz of brown sugar
4 oz of butter
8 oz of gingernut biscuits
½ cup of milk
¼ tin of condensed milk
1 tablespoon of golden syrup
1 teaspoon of vanilla

Crush the gingernuts. Mix all the other ingredients together and boil slowly for 30 minutes. Add the crushed biscuits and vanilla. Spread in a 10 in. square tin and cut when nearly cold.

As this is extremely rich, cut into small fingers or pieces.

Cherry Winks

7 oz of butter
3 oz of icing sugar
3 oz of cornflakes
Glace cherries, halved
6 oz of flour

Cream the butter and sugar until fluffy. Blend in the roughly crushed cornflakes mixed with the flour. Shape into small balls and flatten each with half a cherry on top. Bake at 350 degrees F for 20 to 25 minutes.

Bumble Bees

1 tin of sweetened condensed milk
1 cup of coconut
1 tablespoon of cocoa
½ cup of raisins
½ cup of chopped walnuts
½ lb of biscuits (wine, tennis, or malt)
½ cup of dates, stoned and chopped
½ cup of sultanas
½ cup of skinned peanuts

Caramelize the condensed milk by boiling the unopened tin in water for 3 hours. Transfer the contents to a mixing bowl. Add the coconut and cocoa and mix well.

Mince the fruit and nuts together. Crush the biscuits and mix with the fruit and nuts. Add to the other ingredients and form into balls.

Roll balls in additional coconut. Allow to set on a tray. Store immediately.

Tutti Frutti Bars

1½ oz of butter
3 oz of sifted flour
1 teaspoon of baking powder
½ teaspoon of salt
5 oz of sugar
1 cup of chopped nuts
1 cup of sliced dates
½ cup of mixed peel
½ cup of chopped glace cherries
2 eggs

Sift the flour, salt, and baking powder. Beat the eggs, and gradually beat in the sugar. Stir in the nuts and fruit, then the butter, melted. Mix thoroughly and stir in the dry ingredients, sifted.

Line a shallow tin with heavy waxed paper. Spread the mixture ½ in. thick in the tin. Bake at 325 degrees F for 30 to 45 minutes until it is firm to the touch.

Turn out, peel off the paper, and cut into pieces when cool. Roll each piece in icing sugar.

Marzipan Bars

4 oz of butter
4 oz of brown sugar
6 oz of flour
1 teaspoon of baking powder
1 tablespoon of golden syrup
1 teaspoon of cocoa
1 egg

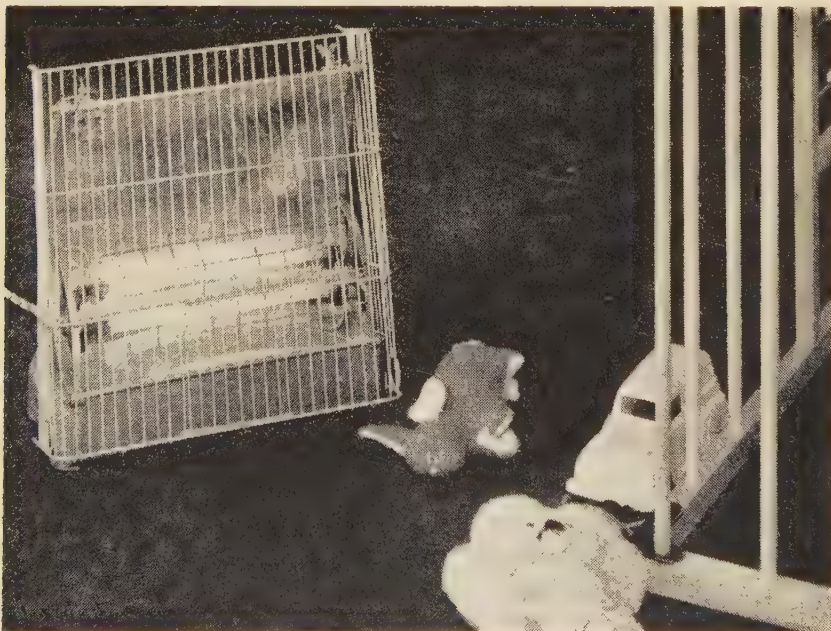
Cream the butter and sugar. Beat in the syrup and the egg. Stir in the sifted dry ingredients.

Spread in a shallow baking tin and bake at 350 degrees F for 20 minutes.

When cool, spread with the following topping:

½ tin of condensed milk
1 cup of coconut
½ cup of sifted icing sugar
½ teaspoon of almond essence

Mix all well together and spread on the shortcake base. When set this may be iced with chocolate icing and sprinkled with chopped blanched almonds, if desired.



[Sparrow

Guards on Heaters Protect Children

UNGUARDED heaters can be a great hazard to young children, and one way to reduce this danger is shown in the illustration. The front portion of a birdcage has been attached to the heater and care has been taken to ensure that the opening on the front of the cage has been securely tied.

Another simple method of putting a guard on a heater would be to attach a piece of ½ inch-mesh wire netting with binding wire to easily accessible points on the heater. When the wire netting is cut it is necessary to tuck in securely any sharp edges which might catch clothing.

—CHRISTINE LYONS,
formerly Home Science Instructor,
Department of Agriculture,
Auckland

Pruning and Care of Ornamental Trees

By J. S. SAY,
Horticulturist, Department of Agriculture, Auckland

TREES have a greater and more permanent influence on our gardens than any other garden feature. This influence can extend far beyond the boundaries of the garden, and whether it is good or bad depends a great deal on the owner, for he can allow and assist them to grow into beautiful specimens or by neglect and ill treatment can turn them into misshapen, unhealthy trees which can spoil the appearance of the garden, the street, and perhaps the whole district. Though many aspects of tree culture call for skill and experience and a knowledge of botany and of the characteristics of individual trees, much can still be done by home gardeners to ensure that trees are maintained in good condition.

PRUNING is usually associated only with fruit trees, but a certain amount of pruning is also important with many ornamental trees, though the reasons for it are somewhat different. It is usually limited to young trees for shaping, but may become necessary with older trees to maintain health, improve appearance, repair damage, or reduce size. Except for these reasons, pruning is rarely needed for healthy, strongly growing trees which have reached maturity.

Pruning to Shape

Young trees often require pruning to improve their shape. Pruning which destroys the character of an ornamental tree is not good, for trees trimmed to unnatural shapes look out of place except in the most formal of surroundings. This applies particularly to trees grown for their irregular, rugged, or distinctly individual growth, and no attempt should be made to force these trees to conform to the more conventional shapes. Trees of this kind include many of the ornamental conifers.

Trees which have a single central leader sometimes lose their growing

tips, especially in their younger stages, and develop two or more leaders. All leaders except one should be removed cleanly at the point from which they arise as soon as possible. It is advisable to retain that which is in the best position, though it may be weaker, so that the symmetry of the tree will not be spoiled. A misshapen tree can also result when a branch grows more strongly than other branches and then gradually becoming dominant, takes over as leader. Any branch which shows signs of doing this should be shortened back to a point just within the general outline of the tree.

Trees which have a spreading habit with no central leader sometimes need a little encouragement to form a well branched and well balanced head. If branches are too sparse, they may be shortened back to force the growth of buds just below the cut as is done with young fruit trees to form the leaders and sub-leaders. If branches are too close or badly placed, some should be cut out when the tree is young.

Any branches that grow more strongly than others so that the tree is likely to become lopsided should be

shortened back to a side growth within the outline of the tree, but it is very difficult to correct uneven growth which occurs where trees are growing fully exposed to a strong prevailing wind or are overshadowed on one side. If conditions causing the trouble are not too severe, sometimes it can be corrected by cutting the strong side back fairly hard.

Training Standards

Five or 6 ft of clean straight trunk is very desirable on many trees, especially deciduous kinds used for lawn specimens, street and avenue planting, or shade. Conifers and many evergreens usually look better if clothed to the ground. Young trees on high standards can be bought from most nurseries, but many can be developed quite easily from small plants. The exceptions are weeping standards and other special varieties which have to be budded or grafted on high standards.

A strong young plant with a single leader should be planted and staked securely. None of the side growths should be removed until the tree has



Multiple shoots resulting from a damaged leader. All but one should be removed and the tree will gradually assume its natural conical shape.

PRUNING ORNAMENTAL TREES



Careful pruning can reduce the size of a tree without destroying its natural shape.

reached the height at which the lowest branches are required, but some may need shortening back so that the leader always remains dominant. At this stage the side branches from the lower half should be removed cleanly to the trunk; the next year the lower half of the branches remaining should be removed, leaving a well developed head with a strong trunk which should not require staking. Types with spreading heads may need to have the tip of the leading shoot removed a foot or so above the point where the lowest branches are required. This will force a number of shoots which will form the framework of the tree.

Pruning to Reduce Size

Trees are frequently planted in positions where they do not have enough room to develop. By careful pruning their size can often be reduced without destroying their character and beauty. For best results this should be done before they reach the maximum size to which they can be allowed to grow. It is done by cutting the longest branches back to laterals (see diagram on this page). The further back the branches are cut the fewer the cuts which will be needed, but the cuts will be larger and the laterals smaller and weaker. The wounds take longer to heal.

A better method is to make more cuts, removing less of each branch. The cuts, being small, heal quickly. The laterals are larger, and if the job is done carefully, the tree can be considerably reduced in size and yet have an unpruned appearance. Pruning should always start at the top of the tree.

Pruning to Repair Damage

Damaged trees should not be neglected. Broken branches usually have extremely rough and jagged wounds which make perfect points of entry for fungi and insects, and they are often split longitudinally, well below the point of the break. Branches which are broken out from their bases often take with them large strips of bark and sometimes wood from the trunk, leaving very large wounds.

Broken branches should be cut off cleanly to a lateral below the lowest point of damage. If the shape of the tree has been spoilt, it is sometimes possible to correct it or mask it by reducing some or all of the remaining branches. Bark wounds are discussed on page 92.

Pruning to Maintain Health

Pruning can do much to maintain the health and vigour of old trees. All trees, no matter how healthy, have a certain amount of dead wood in them. Weak branches get crowded out or die through lack of light. It is natural for this dead wood to rot and fall off. Sometimes the wound heals, but frequently the rot continues down into the main branch or trunk and gives rise to rotten cavities which are difficult to treat once well established. Treatment of these cavities is discussed on page 93. Dead branches should be cut off cleanly as soon as noticed.

Trees are often seen with large dead branches toward their tops. These are sometimes called "stag heads". This condition usually occurs when the roots reach some unfavourable soil condition such as a hard pan, rock, or a high water table. It also happens with a number of cold-climate trees, especially English oaks, in warm districts. These dead branches should be removed to a side branch well below the dead area, not only for health reasons but also to improve appearance.

Trees which suffer severe root injury because of excavations, or some similar cause, can be assisted by reducing top growth to balance the loss of roots. When large trees are shifted without adequate preparation or facilities a reduction of top growth will hasten establishment.

Pruning that exposes normally protected bark to the sun will sometimes cause sunburn and subsequent death of the bark and ultimately the branch or tree. Where possible it is better to remove a number of small branches rather than a few large ones or to spread the pruning over a period.

Trees and shrubs in shady positions can also be damaged if suddenly exposed to full sun or wind by the removal of buildings and other trees.

Pruning for Appearance

Pruning for appearance has largely been dealt with, but one or two additional points are worth mentioning. Sometimes the appearance of a garden or the landscape can be improved by altering the shape of a tree, by reducing its size, or by opening up a view through the trees. Pruning for this purpose should be given very careful thought. Too frequently trees are cut back for a view which is then spoilt by eyesores in the foreground. It is better to remove the trees completely unless the job can be done skilfully. The same applies when trees are severely cut back to let the sun in.

Pruning Conifers

When conifers are being pruned and trained it is important to remember that few of these trees are capable of producing new growth from old wood. As much as possible should be done simply by pinching or cutting out the soft, young growths. If any cutting has to be done to old wood, all cuts must be made to a side growth. Pine trees and shelter belts of macrocarpa and Lawson's cypress bare at the base or on one side are common sights about the countryside and are the result of severe cutting back into old wood.

Columnar types of conifers can be kept to a good shape simply by cutting back young shoots which are spoiling the symmetry to an inward and upward pointing side shoot. This system of training is particularly important with Italian cypresses. By keeping them to a single leader and pruning the side shoots as described above they can be kept to a good columnar shape which is infinitely more attractive than the ugly bundles tied up with wires and ropes which disfigure so many gardens. Conifers pruned in this way do not have the unnaturally smooth, shorn appearance that frequent use of hedge shears gives.

Conifers with distinctive shapes which, combined with texture and colour, give them a very characteristic appearance need very careful treatment if pruning is necessary to control their size. Drastic pruning can spoil their shape and also cause bare patches if taken back into old wood. Pruning for shaping or to control size should be limited to cutting out young shoots.

Most conifers have a flush of growth in spring or early summer. Pruning is normally done just before this so that pruning cuts heal quickly and are soon covered. Pruning may be done after the flush if it is desired to limit the size of the tree. As little growth is made afterward, the tree remains roughly the same size for the

rest of the year, and the reduced leaf surface also has a dwarfing effect.

PRUNING ORNAMENTAL TREES

Pruning Groups of Trees

Trees which are growing close together in groups should be pruned as a group and not as individuals. In group planting, trees retain their own individuality, though they may be only one sided or have leaves only on the top. In the younger stages of group planting individual pruning may be necessary to control faster and more vigorous species to prevent them from smothering others. A better method is to include a few shrubs or small trees which can be completely removed as the permanent ones become large enough.

Pruning Time

The best time to prune deciduous trees, other than spring-flowering

The correct way to remove a ➔ branch is to cut it off about 18 in. from the trunk by under-and-over cutting so that the bark is undamaged and the weight is removed before the final cut is made. The stub should then be removed close to the trunk by the same method, after which the wound should be trimmed with a sharp knife and dressed with a waterproofing material.

types is during the dormant period. It should not be left too late, as some trees bleed badly when the sap flow starts in early spring. This pruning usually results in vigorous spring growth, and unless it has been very severe trees are very little smaller at the end of the season than they would have been if left unpruned. By pruning in summer after the flush of growth, when the trees have a summer resting period, a more permanent reduction in size will be achieved. Winter pruning can often be used to invigorate deciduous trees which are showing some signs of declining, but it cannot normally be used to rejuvenate very old trees.

Pruning of deciduous trees which flower in spring is usually left until after petal fall, unless they are trees with autumn fruits, when it may be done after fruit fall, but this will probably reduce the number of flowers the following spring. Most spring-flowering trees should not need extensive pruning if they have been well shaped in their younger stages.

Broad-leaved evergreens may be pruned at almost any time of the year, but the best time is late winter or early spring. Winter pruning which opens up the tree may result in frost damage to the bark in cold districts. Summer pruning can result in sunburn, but this is not common. Autumn pruning can force young growth, which is susceptible to winter damage.



[Green and Hahn

CARE OF WOUNDS ON TREES



A small superficial wound. Though wounds of this kind usually heal quickly without any attention, they can give rise to cavities. The damaged bark should be trimmed back and the wound given a waterproof dressing.

Pruning Cuts

The most important point to remember when pruning or removing branches is that stubs should not be left. This applies whether the shoot or branch is $\frac{1}{4}$ in. in diameter or 6 or 8 in. or more. A few trees which have dormant buds in the old wood, such as *Schinus molle* and *Camphora officinalis*, can be cut almost anywhere and will shoot again, but a stub in poor light in the middle of a tree will not break into growth even though the tree is a species in which this normally happens. It is always safer to prune carefully without leaving stubs.

All cuts should be cleanly made and the correct method and sharp tools in good condition should be used.

All wounds above 1 in. in diameter should be given a protective dressing.

Shoots and Small Branches

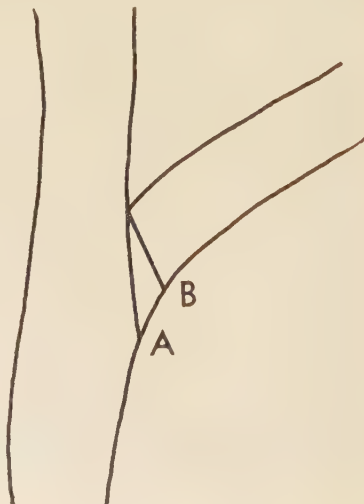
Shoots and small branches are usually removed with secateurs, but if they cannot be cut easily without undue pressure, wrenching, or twisting, a saw should be used. The rough edges and surface left by the saw should be trimmed with a sharp knife.

Large Branches and Limbs

Unless the correct method is used when large branches and limbs are removed, jagged stubs, cracks, and stripped bark are almost sure to result. Never remove a heavy branch with a single cut; at least two are needed. The best way is to lop off the branch

18 to 24 in. from the desired point (by under-and-over cutting) and then carefully remove the stub by the same method (see illustration on page 91). The edges should then be cleaned with a sharp knife and dressed with a protective covering.

Opinions differ about the exact position of the final cut. It may be parallel with the trunk (A in diagram below) or slope slightly outward (B in diagram). The former leaves a larger wound which is more liable to infection but usually heals faster than the smaller wound left by the other method.



Stubs and Disease

The reason for not leaving stubs is that, unless they are capable of breaking into growth again, they soon start to rot back. This decay continues back into the larger limbs and trunk which, in time, may become completely rotten in the middle, thus weakening the tree and aging it prematurely. Rotting back from branches that die naturally has already been mentioned.

Treatment of Wounds

Tree wounds may be divided into three main types pruning wounds, superficial (bark) wounds, and cavity wounds.

Pruning Wounds

Pruning wounds over 1 in. in diameter should be treated with a suitable dressing, but smaller cuts rarely need this attention unless the work has been done carelessly or on a species which does not heal rapidly. Bituminous paint or petroleum jelly is suitable except for very large cuts which may need disinfection before covering. Conifers which exude resin do not need treatment as a rule, but it is good practice to smear the resin over the cut surface.

Large cuts made when branches are removed usually need periodic dressing with a waterproof material until the wound has completely healed. Unless this is done the wood cracks and rotting may set in. Though the healing callus growth continues and may ultimately cover the wound, rotting may continue to spread back under it.

With large cuts on vertical branches the cut surface is often flat and, if neglected, will soon form a water cup when the callus forms on the edges. This type of wound is the most difficult to deal with. A metal cap is sometimes advised, but this usually only provides a harbour for insects. It is better to slope the cut and treat it with a waterproof dressing.

Superficial Wounds

Superficial wounds may be of two kinds, those which are expected to heal quickly and those which are extensive and are likely to take a long time to heal or perhaps may never heal completely.

Small superficial wounds are usually left to heal themselves without any attention and most of them do so quite satisfactorily. In spite of this it is not good practice, as any open wound can be a point of entry for disease, which may not become obvious for many years if it develops under the callus growth.

The best way to treat such wounds is to trim the damaged bark back with a sharp knife to the sound part. If it



The beginning of a cavity. The removal of a large branch left an extensive wound which cracked as it dried out and then began to rot. This could have been prevented by an application of a waterproof dressing. The vigorous callus growth would have soon grown together over the cut and healing would have been complete.

is trimmed to an oval shape (with the long axis running with the grain), it will heal more quickly than a circular wound. The exposed wood should be treated with a suitable dressing as soon as it is dry.

More extensive wounds where large areas of bark are stripped off or loosened should never be neglected, as they usually result in large cavities. This type of damage is very common where large limbs are being removed with a single cut or where they are in a position where they can be struck by vehicles, mowers, etc. Fires near trees can also cause a similar type of wound.

All damaged bark should be trimmed away cleanly and any injured wood removed to leave a smooth, clean surface. When dry the exposed surface should be disinfected and waterproofed. Metal covers are sometimes put over large trunk wounds after treatment. Zinc, being soft and easily cut, is generally preferred. A gap of $\frac{1}{8}$ to $\frac{1}{4}$ in. should be left between the edge of the metal and the undamaged bark. If the cover is fitted too close to the edge of the uninjured bark, the callus may grow under the metal and force it off. The edges must be fitted down very tightly so that the cover is perfectly sealed. It can be held in position with small brads and finally given another waterproof dressing. All wounds whether open or covered should be inspected occasionally and the waterproof covering renewed if necessary.

A recent article in an overseas publication indicates that polythene may be one of the best materials for covering superficial wounds. It described how a tree which had been completely

Cavity Wounds

Cavity wounds are of three main types. The large superficial wounds which have just been described often give rise to large open cavities in the trunk, and if the injuries have occurred fairly low down, the cavities often extend below ground level.

Cavities with only small openings are usually the result of the rotting back of stubs or dead branches. Though these cavities can be very large, often extending through the entire heartwood of the trunk, often their presence is not suspected. Cavities are often found in the crotches of two limbs or branches. Where the angle between them is very acute the joint is weak and cracks, allowing water and fungi to enter. These cavities may also be extensive, yet not visible at a casual glance, and further weaken the joint.

Before large cavities on a tree are treated the general health, age, and appearance of the tree and the safety factor should be considered. Very old trees nearing the end of their natural life are not worth the trouble and expense unless they are of some historical value or are in a very prominent position.

This type of repair does not normally extend the life of trees, but improves their health and appearance. Where cavities are so extensive that the tree is structurally weak it should be removed, for this type of treatment can do little to make it more safe and can give a false sense of security.

The primary cause of cavities is wood-rotting fungi which enter

girdled had the damaged portion wrapped in polythene and stated that the wound had healed in a remarkably short time. The damaged bark and wood were trimmed cleanly with a knife, moistened with water, and then wrapped twice round with polythene, which was tied at the top, bottom, and middle, but not sealed. Though the wound was not disinfected and the warm, moist conditions under the polythene were ideal for the development of fungi, the wound did not become infected.



This extensive cavity was caused by a large strip of bark and some wood being torn off when a branch was removed without proper under-and-over cutting.

through some break in the bark and ramify through the wood. The first step is to remove all rotten and discoloured wood down to apparently healthy tissue. To do this it will probably be necessary to enlarge the opening. As the mycelia from the fungi usually spread several inches out from the rotten part, it is almost impossible to remove all the infection. If the base of the cavity is lower than the opening so that water collects in it, the opening should be enlarged so that it will drain freely. A drainage pipe may be put in instead, but this is not as satisfactory. Cavities extending below ground level must be filled after they have been cleaned out, as it is not possible to drain them.

After the cavity is thoroughly cleaned out it should be disinfected with creosote, copper sulphate, or acidulated mercuric chloride, and then



Rough breaks and split branches are typical of storm damage and are ideal places for the entry of wood-rotting fungi and insects and should not be neglected.

that it is impossible to examine the wound once it has been filled. Periodical examinations should be made in case the infection becomes active again.

The tools most likely to be needed for this work are chisels and gouges of various shapes and sizes, a mallet if space permits its use, a knife, and a scraper of some kind. A small saw may be handy and a brace and bit or an auger is useful for determining the extent of infection.

Filling Cavities

Concrete is not a good filling, though it is frequently used. With large fillings it can cause chafing as the tree moves and it expands during the heat of the day, whereas trees tend to expand at night. It is not waterproof. It is fairly satisfactory for filling basal cavities provided the surface is well waterproofed with bitumen. If very large cavities are to be filled, the concrete should be put in in 6in. layers with tarred paper between them to allow movement. The open surface must be treated with bitumen.

The most satisfactory filling is a mixture of 3 parts of sawdust and 1 part of a bitumen preparation. It is elastic, adheres to the wood, and is waterproof.

The filling material should not be brought up to the level of the outside of the bark. It must stop below the cambium layer, which is just beneath the bark, so that the callus can grow over the filling.

Wound Dressings

There is no ideal material for dressing wounds, but a number of substances can be used. Some have good fungicidal and germicidal properties, but are not waterproof and vice versa.

Bordeaux paint made by mixing 3 to 4 lb of dry bordeaux mixture with 1 gallon of raw linseed oil is a good fungicide, but must be renewed every few months on large wounds that do not heal quickly. A fresh mixture should be made each time, because bordeaux mixture does not keep.

House paints of various kinds are not satisfactory. They have no antiseptic action and frequently crack or blister. The oil in them penetrates into the wood and may have some value, but other ingredients are likely to burn the cambium. Varnish made from resins dissolved in oil or spirit is not suitable for fresh wounds, but is useful for waterproofing old wounds. It has no fungicidal action. Shellac varnish is extremely useful for applying to cut edges to give protection to the young cambium.

Waterglass used for preserving eggs can be used to prevent the cambium



Weak crotches which crack and allow entry of water and fungi often give rise to extensive cavities. The whole inside of the trunk of this tree is rotten to ground level, but nothing can be seen from the outside. Double leaders if left on young trees are a common cause of this type of joint.

from drying out and is good for waterproofing small, quick-healing superficial wounds.

A proprietary bitumen preparation is excellent for waterproofing, but is not antiseptic or penetrating. It is durable, plastic, and does not injure plant tissues. It is excellent for applying after wounds have been disinfected.

Bituminous paint is good for small pruning wounds and others that heal quickly.

Petroleum jelly is very satisfactory for covering small wounds and pruning cuts to prevent the entry of fungi and water, but has no antiseptic qualities.

Creosote is useful for protecting wet wounds, but may cause some damage to the cambium layer. Other disinfecting and waterproofing materials can be applied when the wound dries out.

Cement and concrete are useless as wound dressings, as they crack and flake off and are not waterproof.

Acidulated mercuric chloride, copper sulphate, and formalin are good preservatives and excellent for applying before a waterproofing coat of bitumen.

treated with several dressings of bitumen. A bitumen preparation which sets hard on exposure to the air is excellent, being waterproof, adhesive, and slightly flexible. These dressings must be applied whether or not the cavity is to be filled.

Opinions differ as to whether cavities (apart from basal ones) should be filled. Filling serves few useful purposes. It may give some slight mechanical support and improve the appearance, but it has some very definite disadvantages, the chief being

Garden Work for August

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Arbor Day, the national tree-planting day, is celebrated every year in New Zealand on the first Wednesday in August. The ground is then beginning to

warm up and citizens should form a habit of planting at least one tree or shrub each year. This need not lead to overcrowding, but older plantings need replacing from time to time and many gardens would be enhanced by the addition of permanent plants to give character.

Permanent Plantings

The planting of trees and shrubs is not desirable, even on Arbor Day, if the soil is not in suitable condition. If the soil cakes or packs down when dug, planting should be delayed. If water appears in the bottom of the planting hole, it is unwise to plant in that area, as few garden plants can thrive if their roots are waterlogged for several weeks during winter. The drainage should be improved before permanent planting is undertaken. Many plants, and especially some of the Australian and South African plants, are shallow rooting and should be staked at planting time, particularly in windy areas.

Pruning Shrubs

Many autumn- and winter-flowering plants will benefit from pruning as soon as the flowers are past their best.

By cutting back shoots which have flowered and thinning out twiggy growths good shape can be maintained and new growth encouraged. The pruning of spring-flowering plants should be left until after flowering or after the flowers have been picked. Some daphne bushes do not require pruning, but *Daphne leucanthe* is improved if picked on long stems to induce shoots to develop lower on the bush and keep it compact.

Spraying Shrubs

Several plants, including hydrangea, manuka, oleander, wisteria, camellia, beech, ash, oak, escallonia, and euonymus are attacked by insects such as scales which suck the sap and debilitate the plants. Deciduous plants can be sprayed with winter oil while still dormant and evergreen plants

should receive summer oil or DDT emulsion to kill these pests.

The spring-flowering ornamental *Prunus* trees are often as susceptible as their orchard relations to the fungous disease leaf curl. To prevent disfigurement by this disease these trees should be sprayed with bordeaux mixture as soon as the buds begin to swell.

Virus Diseases

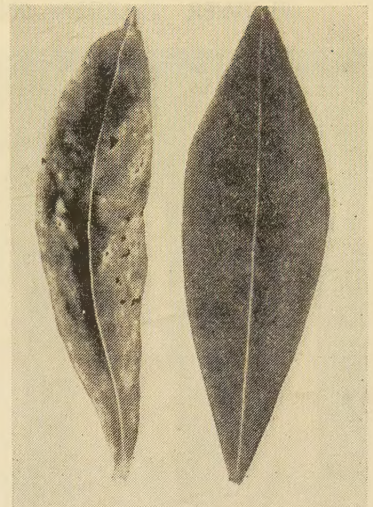
Many garden plants are attacked by virus diseases against which no sprays are effective and symptoms commonly occurring are mottling of leaves, distortion or colour break of flowers, and degeneration of plants.

Plants should be kept clear of insects, some of which spread viruses, by spraying, and any plants which are severely affected by virus should be removed and burnt. Most daphne plants in New Zealand appear to be infected with cucumber mosaic virus. Plants with the disease but with only very mild symptoms of mottling will live if given additional dressings of a balanced fertiliser and kept free from insects which would spread the trouble. All badly affected daphnes should be destroyed.

Care of Roses

August is a good month for the main pruning of rose bushes, though in frost-free districts this may be done earlier. All dead, diseased, weak, or crossing branches should be removed cleanly with sharp secateurs. The remaining good, sound growths should be pruned back to good buds, the severity of pruning depending on the vigour of the bush. Generally, strong-growing plants should be pruned more lightly than weaker-growing plants if a maximum number of blooms is required. All cuts should be made $\frac{1}{4}$ to $\frac{1}{2}$ in. above a bud and slanting downward away from the bud.

Covering rose pruning cuts with proprietary sealing compounds has not been shown to reduce the tendency of some varieties, such as Brazier, to die back. It is preferable to spray these varieties immediately after pruning with bordeaux mixture. Varieties such as Isobel Harkness and Josephine Bruce which are susceptible to powdery mildew attacks should be sprayed after pruning with lime sulphur, 1 part in 15 parts of water, to combat the winter spores of this fungus. Bushes infected with rose scales should receive a spray of winter oil after pruning, and while the plants are still fully dormant, or alternatively summer oil or malathion during the growing period.



Daphne leaf infected with cucumber mosaic virus (left). The leaf at right is healthy.

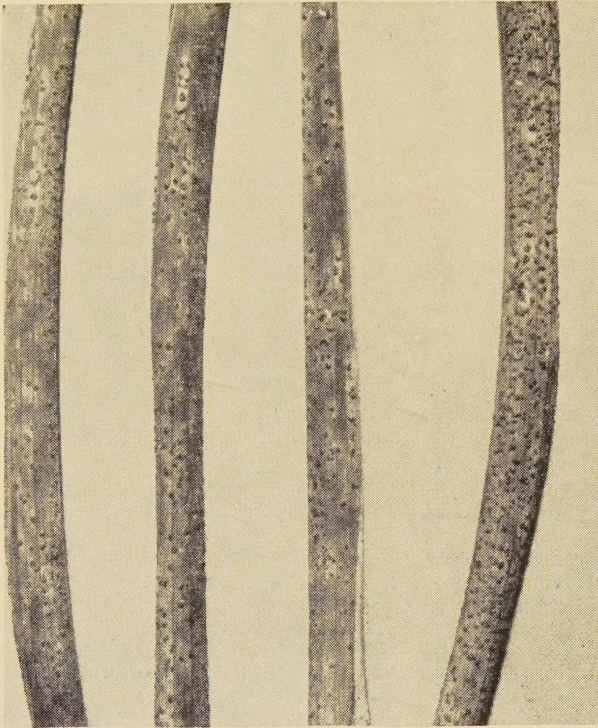
Border Tasks

If the soil in the mixed border is being replenished by the generous addition of organic material such as animal manure, compost, seaweed, spent hops, etc., it is easiest if the plants can be removed and the whole area dug over to incorporate the organic matter.

Michaelmas daisies, scabious, monarda, rudbeckia, doricum, and other plants which throw many new growths around the base can be divided up and the more vigorous outside portions replanted. Cuttings of chrysanthemums, delphiniums, and lupins can be placed in a box of sandy soil to root. They should be planted firmly, watered into position, and covered with paper or scrim to reduce transpiration. If the box is placed in a cold frame, the cuttings will root more readily because of the generally higher temperature.

If an increase in the number of dahlia plants is required, the old stools can be covered in boxes with moist sand or sawdust and placed in a frame to force the shoots to develop. The stools can later be divided up or the young shoots rooted individually.

Paeonies, phlox, oriental poppies, gaillardias, and anchusas are some of the plants which can be increased by taking root cuttings at this time. Cuttings can be 2 in. long and are generally made with a slanting cut at the base and a flat cut at the top so that they are not planted upside down. They can be boxed up, with the top of the cutting at ground level, to develop shoots. The thin roots of phlox can be laid horizontally in the box and covered with a shallow layer of soil.



These brown pustules of iris rust appear a little later in the season on the foliage of affected bulbous iris.

Irises

Bearded irises which are growing under poor cultural conditions are very prone to attack by the leaf-spot fungus *Didymellina macrospora*. This usually is most severe when the plants are suffering from lack of phosphates or an excess of organic matter which has kept the conditions too moist, accentuated by poor drainage. Foliage which has been attacked by leaf spot should be removed and burnt. All irises will benefit from being sprayed now with copper oxychloride mixed with water to which a sticker such as casein has been added. A dressing of superphosphate at 4 oz per square yard should be given to all plantings of irises.

A rust fungus seen as small brown pustules has been found in recent years on the foliage of bulbous irises. Sprays of zineb may prevent the spread of this disease, but early lifting, cleaning, and storing of the bulbs for at least two months appears to assist in giving a clean crop the following season.

Bedding Plants

The beds of flowering plants will benefit from being carefully forked over between the flowers to aerate the soil after winter rains. Weeds should

be removed at the same time. The removal of dead flower heads from anemones and Iceland poppies will prolong their flowering season. If polyanthus are making slow development, a liquid feed of 1 oz of sulphate of ammonia to 1 gallon of water may encourage them.

In very early districts a start could be made with the planting out of the most hardy bedding plants for an early summer display. This should be attempted only on a fine day when the soil is reasonably dry after a drying wind. In early districts sweet peas could be planted out, but in other districts soil preparation for later planting could be given.

Seed Sowing

Preparation can now be made for the main sowing of spring seeds next month. Compost, sand, and soil could be sieved separately through a $\frac{1}{8}$ in. sieve. Boxes and pots can be scrubbed clean and dipped in a mixture of 1 part of formalin to 49 parts of water to kill any fungi. New pots should be soaked before use; otherwise the pots may leach so much moisture from the soil mixture that the seedlings will suffer.

In warm positions outdoors, sowings can be made of sweet peas, larkspurs, clarkia, godetia, nigella, cornflowers, and annuals such as linaria, candytuft, and mignonette which do not transplant very well.

Under glass, seed of a wide range of plants can be sown now. The rust-resistant strains of antirrhinums are of very doubtful value nowadays in New Zealand, as, though these varieties are resistant to the strains of rust known in England, where the resistant strains are bred, they are not resistant to the strains of rust that have developed in New Zealand. It is sometimes possible to prevent rust by continued spraying of the plants with zineb.

Lawns

Though autumn sowing of lawns is preferable, seed can be sown in August

with reasonable success in most districts. The standard lawn mixture for New Zealand conditions consists of a mixture of 2 parts of Chewings fescue to 1 part of browntop used at $\frac{1}{2}$ to 1 oz per square yard. A fertiliser and grass-grub preventive dressing consisting of 30 oz of sulphate of ammonia, 10 oz of superphosphate, and 1 oz of 50 per cent DDT powder should be applied to every 40 square yards.

Autumn-sown lawns could now be rolled to consolidate the root area after the frosts. A repetition of the above fertiliser mixture is advisable. When young lawns have made sufficient growth they can be given their first cut at a height of 1 in. The mower should be very sharp and clippings should be removed, as they keep the light from the young plants and may encourage fungal activity as they decay.

Plants under Glass

Cuttings of double lobelia, geraniums, balsams, and irises, which should root readily now, will give plants for setting out after frosts are past. It is unwise to hold these plants under plastic frames or covers, as damage from frost has been known to occur. The plastic encourages high humidities and rapid loss of heat at night.

Greenhouse plants of a shrubby nature such as fuchsias and hydrangeas can be started into growth in a sunny spot and repotted when growth begins. This is a desirable time to give attention to plants of the maidenhair ferns. Young plants in small pots can be potted into a free soil mixture in a larger pot. Old-established plants which are deteriorating should be turned out of their pots and the roots divided up before they are repotted.

If heat is available, a few glorioxias for early flowering can be potted up.

Young seedlings should be pricked out as soon as they are large enough to handle; they should not be left in seed trays any longer than necessary.

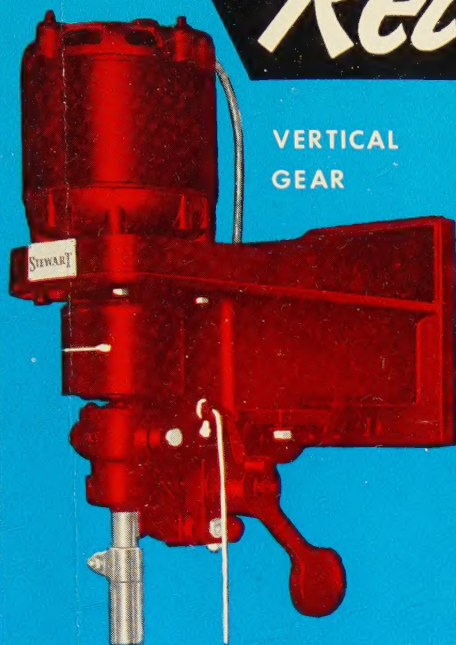
General

A general fertiliser mixture for boosting special plants in the flower garden can be made by mixing 3 parts of blood and bone, 2 parts of superphosphate, and 1 part of sulphate of potash. This could be used at 2 to 4 oz per square yard. Lime should be used sparingly; that used in the making of the compost heap is generally sufficient to supply the calcium needs of the flower garden.

Rock garden plants should be examined after winter and firmed into position after lifting by frosts. Soil should be replaced where winter rains have caused erosion. Dead or dying foliage should be removed from the base of plants.

Any drainage deficiencies which have become evident during winter should be rectified now.

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